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THE IRON AGE

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▲▲▲ THE IRON AGE ▲▲▲

DECEMBER 22, 1938

ESTABLISHED 1855 Vol. 142, No. 25

"Let Not Thy Left Hand Know What Thy Right Hand Doeth"

THIS Biblical injunction, written many centuries ago by St. Matthew, referred to charity. St. Matthew did not deal in prophecy like St. John, who in Revelations may have foretold the New Deal in his description of wheels within wheels and strange things to come.

However, St. Matthew's injunction is apparently being followed to the letter by our present day Federal administrative agencies, although not altogether in respect to charity.

For example, there is the O'Mahoney Monopoly Investigating Committee which has just broken the ice of a two-year probe of business practice. The announced purpose of this is to find out what is wrong with private industry and to improve its efficiency so that customers will get more for their money. In this connection a good deal of emphasis is being laid upon the necessity of decreased costs and prices, or at any rate, the latter.

On the other hand we find other Federal agencies whose chief purpose and pleasure in life seem to be to find ways of increasing costs and prices to the consumer.

For example, consider the experience of a contractor with the PWA which is described in a letter which follows. Names have been deleted for obvious reasons.

> "We recently rented a bulldozer to backfill 300 ft. of water pipe trench to a company having a contract under PWA to lay pipe at a Pennsylvania State institution. We had this machine nearby and had our operator, to whom we pay 65c per hour, run the machine over to the job. Because it was a PWA job, the contractor had to use a union operator at $1 an hour. Our man would have backfilled this trench in two hours at a cost of $8 for himself and bulldozer. The union operator worked all one day and most of the next before he finished the job. This was 16 hours' rent of the bulldozer at $3 an hour or $48.
>
> "When the contractor tried to pay off the operator for two days' work at $16 he found that the union required him to be paid for a week, as he was a Philadelphia operator and couldn't be hired on an out-of-town job for less than a week. This meant $48 for six days of which he worked only two days.
>
> "Thus, instead of costing $8, the cost of this 300 ft. of backfill was $96.
>
> "This same machine when it left the PWA job was transferred to a private job nearby and in four hours with our own operator backfilled 500 ft. of trench, for which we received $35 for machine and operator."

As was recently remarked by the President, we now seem to be going places. But why, we might ask, go in opposite directions at the same time?

J. H. VanDeventer

HEAT CONSERVATION

By J. G. COUTANT
Fuel Consultant, New York

ONE way toward increased profits is in the utilization of recent improvements in blast furnace stoves, and in thermal recuperators and exchangers. In general capital outlay is sharply cut and operating efficiency greatly improved.

IN the development of the steel industry from the middle of the nineteenth century, there have been several periods of hesitancy during which time additional technical progress seemed most elusive. But in each case, prominent technical advances came to the fore to carry the industry to new heights, as reflected in greater efficiency, reduced cost and improvement in product.

Since 1930 the steel industry has labored through a hectic rebuilding program, a complete revamping of rolling equipment. This phase has about run its course, and the results pricewise and in quality of product have been well publicized. Over a longer period of time, the first step in steel production, the blast furnace, has likewise gone through a slow evolution, primarily in the treatment of ores and in the handling of furnace burden. The result has been that the number of blast furnaces has been reduced more than half in a half of a century —575 blast furnaces were available then, as compared with 236 now, even though output has quadrupled to 51,-221,000 tons.

But despite numerous trends such as the two mentioned, the steel industry has progressively been pressed competitively, and the past few decades have witnessed a steady decline in profits relative to capital investment. Consequently, the industry is increasingly on the *qui vive* for more efficient techniques, and a few members have already seen that in a manufacturing procedure that uses heat in tremendous quantities a little more attention to thermal efficiency can pay excellent dividends.

Heat from fuel has always escaped by two principal routes; by way of the refractory furnace linings and by way of the heat contained in the exit gases to the atmosphere. Most of the latter heat can be recaptured for use. For the former, note that refractories act like sponges for heat, and waste it by radiation comparable to dripping of water. And the larger the amount of heat accumulation in the furnace walls, the greater the loss whenever the metal charge is drawn or poured from the furnace.

Furnaces made of low-heat storage or insulating refractories imprison the heat near to its source of liberation from the fuel, and, even more important, less furnace mass is heated in operation. The combination of these two factors can possibly reduce the gas bill 50 to 80 per cent and the oil bill 50 per cent. Furthermore, the furnace output is greater and products are often more uniform because of higher furnace temperatures and greater controllability. An ordinary firebrick forge furnace attains, say, 2500 deg. F., whereas if the same furnace were lined with insulating refractories the temperature may rise to 2700 deg. F. with the same fuel consumption. The amount of heat reflected to the metal per sq. ft. per hr. would be doubled, as will be demonstrated later. Methods for determining the probable performance of such installations were discussed in THE IRON AGE of March 17, page 27-29, and Oct. 13, page 247-254.

It is not uncommon for actual service reports to show or advertisements concerning insulating refractories to claim a 70 per cent reduction in heat treating costs; or a $200 job paying for itself in three weeks; or an installation to earn 20 times its initial cost annually; or furnace output doubled; or working conditions improved; or equipment meeting shorter working day demands; or better products resulting. All these are the tangible results of a more complete utilization of imprisoned furnace heat.

Heat escaping from a furnace in the

exit gases may amount to 10 or up to 85 per cent of the total heat content of the fuel, depending on the temperature of the exit gases. This waste heat in many instances is partially recaptured by means of heavy fireclay regenerators and recuperators employed in preheating combustion air. Such equipment has been more or less successful depending on the skill of the furnace designer. But all are subject to refractory heat losses, coupled with leakage, breakage, porosity, etc., and all have a very low rate of heat transfer as compared with metal. Thus, they are not an ideal means for arresting run-away heat.

A very definite recent trend is toward the use of special heat resistant steels for hot blast stoves and recuperators as an efficient means of recapturing heat from gases, and also a means of minimizing time lag in furnace operations such as starting and stopping. Last but not least the use of steel permits great increases in gas pressure, a definite factor in the speeding up of heat recovery.

Recaptured heat returned to the furnace with the combustion air does triple duty. To exemplify this, consider an oil-fired forge furnace made of firebrick which receives cold charges to heat to a temperature of 2200 deg. F., the furnace temperature being 2400 deg. F. Referring to Fig. 1, the chart entitled "Heat Absorbed by Hot Surfaces at Different Furnace Temperatures" shows on the left margin a rate of 12,000 B.t.u. per sq. ft. per hr. for a temperature of 2400 deg. F. reflecting heat to steel in the furnace at 2200 deg. F., or a probable 5 per cent thermal efficiency. If the same furnace is lined with insulating refractories which permits a furnace temperature of 2600 deg. F., the reflected heat passes at the rate of 24,500 B.t.u. per sq. ft. per hr. Twice the amount of heat is radiated to the metal with the same amount of fuel in a given time, and the furnace efficiency is 10 per cent.

The exit gases from the furnace at 2200 deg. F. carry away 62 per cent of the total heat from the fuel; some of this can be reclaimed by metal heat recuperators and when returned to the furnace, where it is imprisoned, the furnace temperature is raised to 2800 deg. F. Therefore, 42,000 B.t.u. are reflected per sq. ft. per hr. by the refractories to the work. The furnace output by this means is increased 3½ times, furnace efficiency is advanced 20 per cent, or by the same token the fuel bill is reduced 75 per cent.

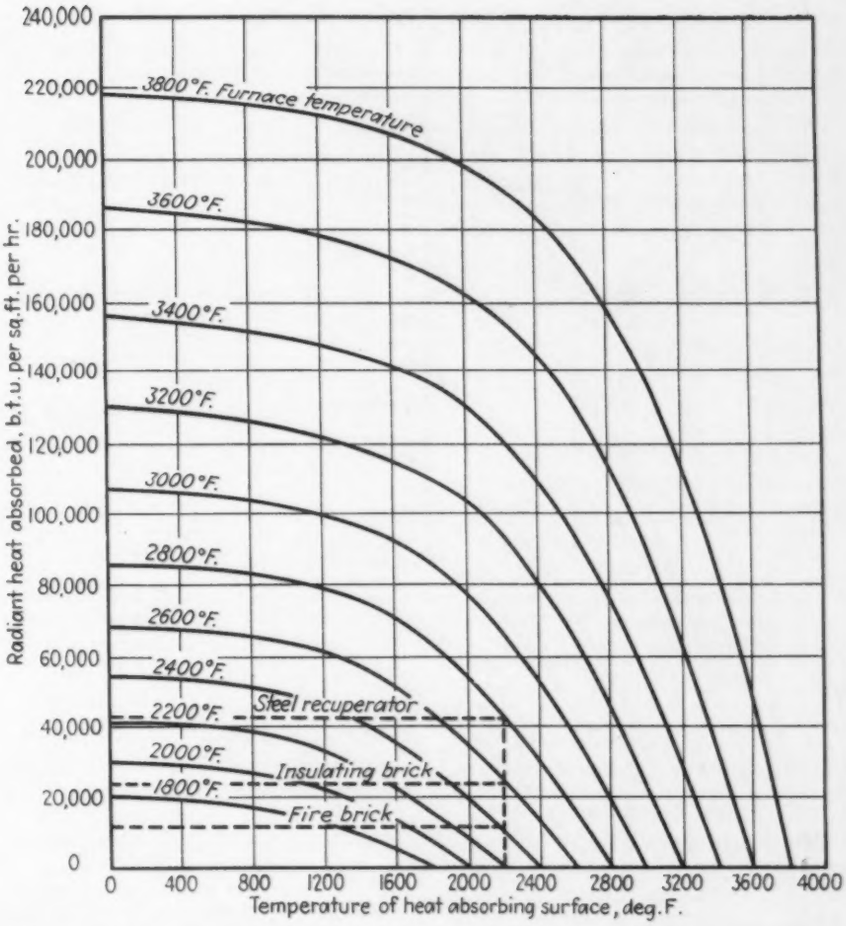

FIG. 1—Graphs indicate various rates of heat absorbtion by different hot surfaces at different furnace temperatures.

A number of installations of steel heat recuperators and steel hot stoves have confirmed these almost phenomenal gains, made possible by the efficient recapture of heat from gases as follows:

(1) A return of heat that does not again escape.

(2) This heat increases the furnace temperature more than the equivalent B.t.u. value of fuel; therefore the reflected heat intensity to metal is proportionally greater. This means a possible 100 per cent increase in furnace output, a reduction in oxidation, and there is also no increase in radiation loss even though the furnace temperature is greater because of the reduced time necessary for heating.

(3) This heat return cannot escape and is extremely efficient as compared with the performance of burning fuel.

The higher the temperature the more steel or metal may be heated each hour in the furnace. It is of interest to determine how quickly metal may be heated. The chart in Fig. 2 shows the heating time for using varying furnace temperatures, as determined by studies of furnace heat transfer from hot

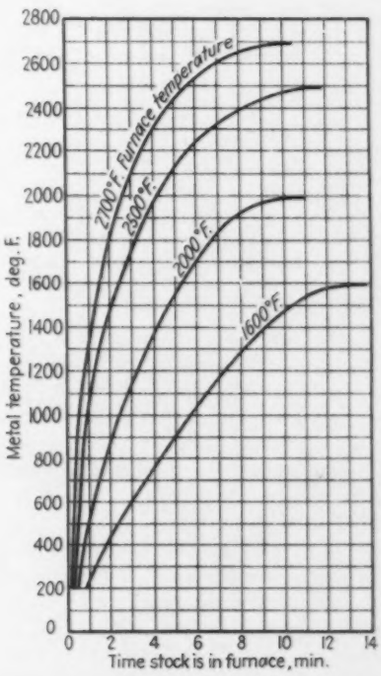

FIG. 2—Heating time for 1-in. steel bars at various furnace temperatures. Note that, of course, at infinite time the temperature of the stock never quite reaches furnace temperature.

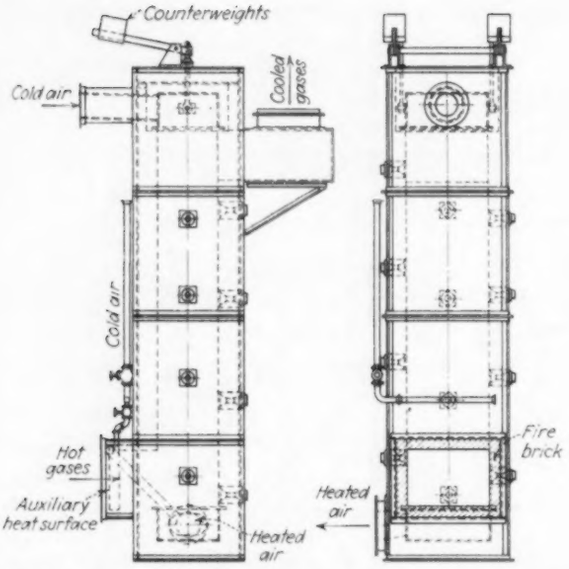

FIG. 3—The Schack vertical metallic heat recuperator. This design functions on the counter-flow principle, and the vertical tubes are under very slight tension by means of the counter-weights.

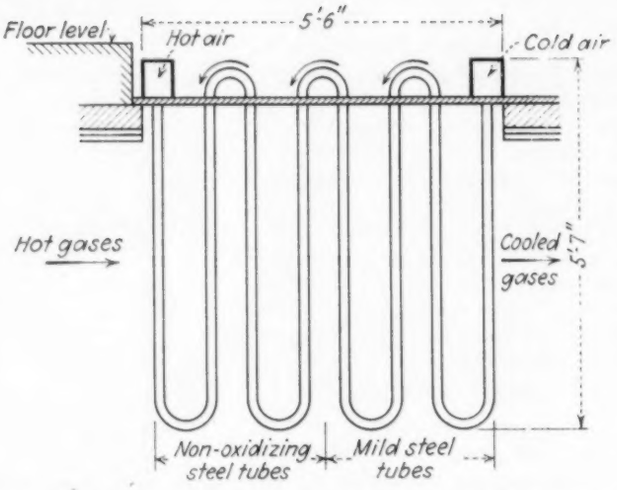

FIG. 4—Metallic recuperator for use in a furnace flue. The sketch indicates three banks of non-oxidizing steel tubes and two banks of mild steel tubes.

gases to 1-in. steel bars made by a large agricultural implement company.

Steel Recuperators

Steel heat recuperators have numerous advantages and also many disadvantages when improperly designed. The advantages are:

(1) The most practical and economical means for the recovery of heat.

(2) Small space required for a large heat recuperation.

(3) Air and gas tightness.

(4) Permits free expansion without rupture.

(5) Permits use of high gas and air pressures, also high gas and air velocities, both of which enhance heat recovery.

(6) Light in weight; no foundations are needed and only very light structural supports are necessary.

(7) Low heat storage and therefore the most adaptable equipment for intermittent operations.

Eight years of experiments in the perfection of metallic heat recuperators have brought out that failures are inevitable, as they would be in a steam boiler when the designer does not take into consideration the relation of pressures, strains, temperatures, and chemical attack encountered to the characteristics and properties of the particular steels employed. Furthermore, a proper control of metal temperatures at all times must be maintained by means of careful correlation of mass and velocity of heating gases and cooling air.

The better heating resisting steels will deteriorate during a long period of heating at too high a temperature. This deterioration may not only result from oxidation, or from sulphurous or other chemical attack, but may arise from mechanical deformation which, traceable to faulty design, produces a rupture in the system.

Regarding some of the properties and characteristics of heat resisting steels, it should be pointed out that chrome-nickel steels are more resistant to deformation at high temperatures but are more sensible to attack from sulphurous and reducing atmospheres. An alloy of approximately 0.15 per cent carbon, 24 to 26 per cent chromium, 19 to 21 per cent nickel has a short time tensile strength at elevated temperatures varying as follows:

1400 deg. F. . . . 44,500 lb. per sq. in.
1500 deg. F. . . . 34,600 lb. per sq. in.
1600 deg. F. . . . 24,000 lb. per sq. in.
1700 deg. F. . . . 16,000 lb. per sq. in.
1800 deg. F. . . . 11,500 lb. per sq. in.

At 1500 deg. F. the "creep strength" (1 per cent in 10,000 hr.) is 1100 lb. per sq. in. A stress of 500 lb. per sq. in. has been used at 1800 deg. F. without appreciable deformation of the material.

Chrome steels have been and are used for high temperature heat recuperator construction, usually having an analysis of 15 per cent chromium for temperatures up to 1400 deg. F. and 30 per cent chromium for temperatures of 2100 deg. F. The latter steel may be subjected to an oxidizing atmosphere at a temperature of 2500 deg. F., the metal temperature being 2100 deg. F. The metal of course will be soft.

Calorized steel may be used in equipment operating at under 1650 deg. F. without any oxidation, and may be subjected to gas temperatures of, say, 1800 deg. F. for preheating air to 1000 deg. F. Chrome-aluminum steels are insensible at very high temperatures to the chemical attack of sulphurous and reducing atmospheres, but at high temperatures are unfortunately susceptible to deformation and rupture.

A metallic recuperator design that correlates in a practical manner mechanical forces and temperature features with gas and air flow is shown in Fig. 3, this particular equipment being the Schack "vertical tube recuperator." Counterweights and auxiliary radiant heating surface are used for diminishing the temperature of the gas before it enters the convection section of the recuperator. For high temperature furnaces, open hearths, reheating and air furnaces, and, also, hot blast stoves, the radiant heat and temperature of gases are too high for direct contact with the tubes which receive a flow of cooling air on their other side. Therefore the radiant heating auxiliary surface receives cold air. Because of the greater difference between the extremely hot fire and hot gases and the very cold air, the metal temperatures of the auxiliary surfaces are maintained at a comparatively low level. This particular recuperator functions otherwise on the counter-flow principle, and the vertical tubes are under a very slight tension through the use of counterweights; it is this latter arrangement which permits free expansion so that the tubes do not collapse

or buckle in case of a little over-heating.

The Schack recuperators are lined with firebrick, which feature retards operation and diminishes heat recovery. This, however, could easily be remedied by the use of insulating refractories or refractory laggings.

In Europe, Schack recuperators are being used to serve a 1200-ton hot metal mixer used to preheat 64,000 cu. ft. of air per hr. from 59 deg. to 1472 deg. F. and 70,400 cu. ft. of blast furnace gas from 68 deg. to 752 deg. F. The advantages of preheating both air and gas are considerable, the metal at the moment of pouring being 54 deg. to 72 deg. F. hotter than that from other mixers that are fired with cold blast furnace gas and preheated air at 572 deg. F. Desulphurization of the metal is thereby facilitated.

A metallic recuperator used for heating the combustion air for a 20-ton per hr. continuous heating furnace, which is charged with cold metal and fired with mixed gas, resulted in the furnace fuel consumption dropping to 1,216,600 B.t.u. per long ton. This represented a 26 per cent fuel economy, as against furnace operation with cold air.

Another type of metallic recuperator is built up of small tubes 1½ to 1¾ in. in diameter, different types of steel being used. These tubes are placed in the flue leading from the furnace to the chimney, as shown in Fig. 4. This type of furnace flue tubular recuperator has been used for supplying hot air to a rotary iron melting furnace fired with pulverized coal. This is an important improvement in the use of this high flame temperature fuel, as the slagging of the coal ash in checkers and fireclay recuperators has previously discouraged its use. This type of flue recuperator for preheating combustion air for the rotary furnace has shown the following practical results:

Hot gas (temperature entering steel recuperator) = 1832 deg. F.; hot air (temperature leaving steel recuperator) = 878 deg. F.; cooled gas (temperature leaving steel recuperator) = 1134 deg. F.; draft (resistance to gas through steel recuperator) = 0.16 in. water; resistance to air through steel recuperator = 12 in. water; weight of gas per hour through steel recuperator = 1873 lb.; weight of air per hour through steel recuperator = 1410 lb.; heating surface of the steel recuperator = 83 sq. ft.; velocity of gas in steel recuperator = 7.6 to 13 ft. per sec.; and velocity of air in steel recuperator = 45.9 to 120 ft. per sec.

The theory of heat transmission shows that the temperatures of the metal walls do not depend alone on the relative temperature of the hot gas and the cooler air, but also on the rate of heat exchange between the gas and metal, and then the heat exchange between the metal and the air.

Mass Flow Important

There is no fixed formula for this heat exchange, though it seems that the rate at which a heated gas gives up its heat to a cooled surface is almost proportional to the mass flow of gas over the surface. Taking the actual performance of about 75 steel air preheaters in service and plotting this on the chart in Fig. 5 tends to show that the proportion does exist for like conditions. It is evident that the gas exit temperatures above the metal and the air temperature below the metal are increasingly greater with augmented mass flow (in lb. per sq. ft. per hr.).

It may be of interest to take this practical data as charted and see how it can be applied to the actual performance as a basis and then calculate the temperature of exit gases; the temperature of exit air; and the maximum temperature of the metal.

The weight of gas per sq. ft. per hr. (1873/83) = 22.516. Weight of air per sq. ft. per hr. (1410/83) = 17.16 lb. In the counter-current flue type recuperators receiving fan air at 120 deg. F., the metal temperature will be some value above the air temperature according to the mass flow 17 lb. which is read (dotted lines) from the chart as being 340 deg. F., and the heat exchange is shown by the chart as being 4.25 B.t.u. per sq. ft. per hr. per deg. F. of gas temperature drop. The metal temperature is then 120 deg. F. + 340 deg. F. = 460 deg. F.

The exit gas temperature will be some value above the metal temperature, according to the mass flow of 22.5 lb., which can be read from the chart as being 540 deg. F. with a heat

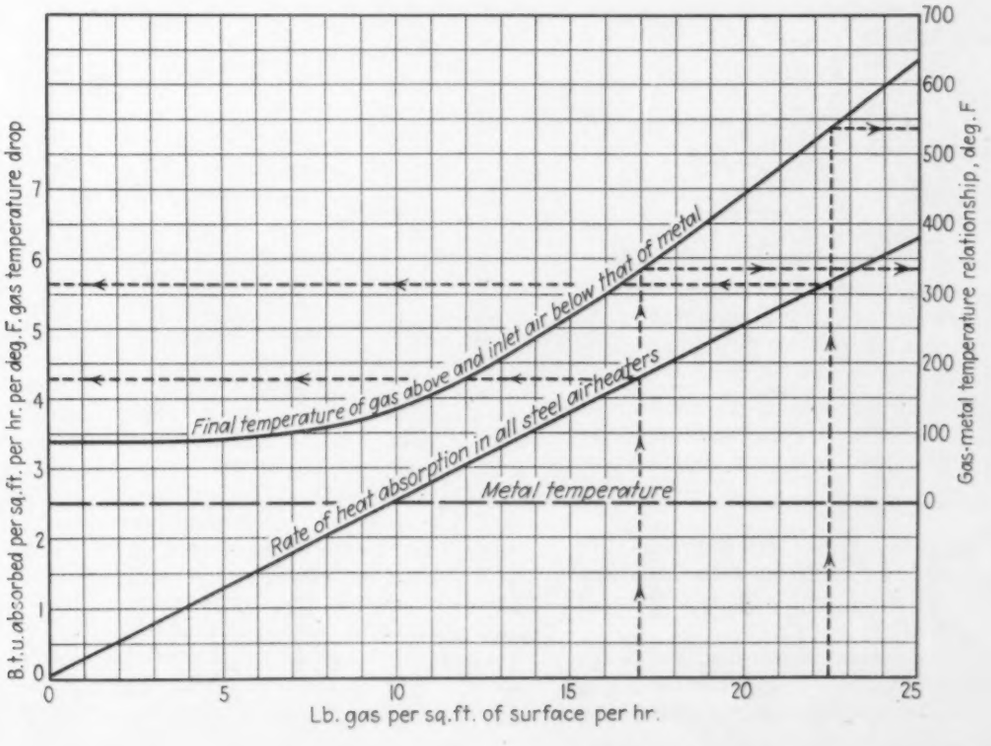

FIG. 5 — Heat exchange and exit gas temperature for different mass flows of gas and air.

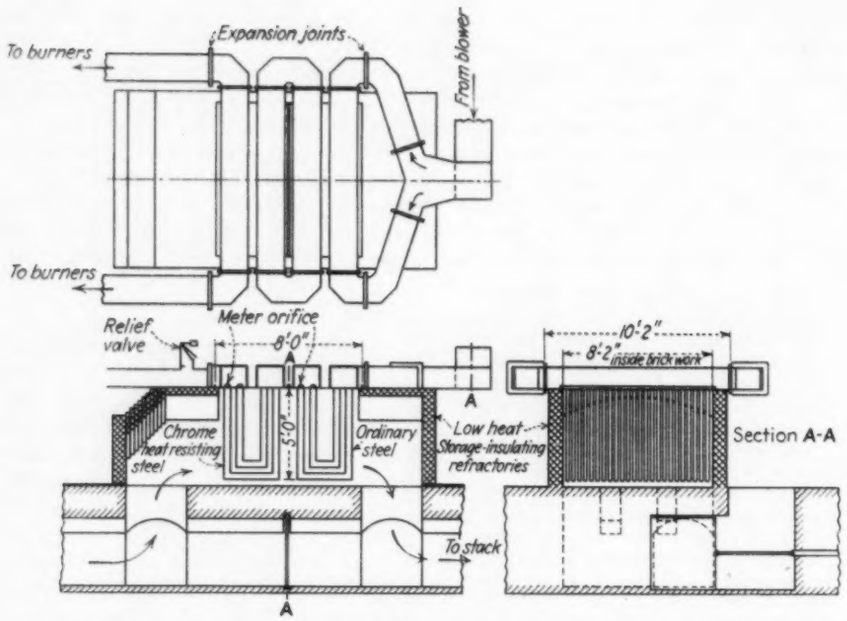

FIG. 6—Duraloy two-unit horizontal flow heat recuperator, designed to heat 1000 cu. ft. of air per min. (cold measure) to 600 deg. F., when the temperature of gases entering the recuperator equals 1500 deg. F., the pressure drop of air equals 1.5 in. of water, and the pressure drop of gases equals 0.04 in. of water.

exchange of 5.6 B.t.u. per sq. ft. per hr. It is noted that the heat delivered is greater than the heat absorbed by the air, and therefore the metal is hotter and the gas temperature is higher: $540 \times \frac{5.6}{4.25} = 711$ deg. F. is the temperature of the gas above the metal.

The temperature of the exit gas (711 deg. F. + 120 deg. F. + 340 deg. F.) = 1171 deg. F. The temperature drop of the gases (1832 — 1171 deg. F.) = 661 deg. F. The amount of heat exchanged to the air $\left(661 \times \frac{4.25 + 5.6}{2} \times 83\right) = 270{,}200$ B.t.u. The temperature rise of the air of specific heat of

$$0.2375 \times \frac{270.200}{1410 \times 0.2375} = 800 \text{ deg. F.}$$

The temperature of the exit air (800 deg. F. + 120 deg. F.) = 920 deg. F.

Notice that the calculated temperatures of the exit gas and air are higher than those found in practice. This is indicative of a small air leakage.

The maximum metal temperature at the end of the recuperator where the hottest gases enter and the hottest air leaves will be a mean $\frac{(1832 + 920)}{2}$ = 1376 deg. F. This is probably the most important value to be determined if troubles and failures are to be avoided.

Considerable mechanical skill in design is required to maintain the proper metal temperatures in recuperators and metallic hot stoves; Schack's design indicates one method of preventing deformation during excessive heating. The Duraloy Co.'s design shows how to prevent overheating by proper cooling and distribution of the cooling air, as in Fig. 6. This flue type recuperator is made in two sections, one of heat resisting steel and the other of ordinary steel. Each section has an area of 500 sq. ft. of heating surface, or a total of 1000 sq. ft. The recuperator receives air under blower pressure at 70 deg. F. and 4000 cu. ft. per min., which is heated to 600 deg. F. by gases entering the recuperator at 1500 deg. F.

The pressure drop in forcing the air through the recuperator is 1.5 in. of water gage, and the draft loss to gases is 0.04 in. of water. The design takes into consideration that the quantity of air flowing to burners must fluctuate with the rate of fuel burning; yet the rate of cooling of recuperator tubes must not fail, because although the fuel supply is stopped there is sometimes enough heat stored in the furnace metal charge and furnace walls to overheat the tubes. Therefore, the relief valve will open when the fuel burning rate is diminished or stopped and metal temperature is maintained by the cooling air. A pressure of 1.5 in. does not always insure equal distribution in tubes, nor much of a margin for operating of the relief valve. There is therefore throttling orifices provided on each tube that controls the mass flow contact and velocity flow contact with the metal, although a slightly increased fan pressure will be necessary. However, the additional power consumed will be compensated for by the better heat exchange to the air.

Fig. 6 shows the steel heat recuperators in a low-heat storage, or insulating, lagging refractory chamber. This also assists in maintaining the proper metal temperatures, but also speeds up furnace operation.

Fluids Poor Conductors

It is well known that all fluids are very poor conductors of heat. They absorb at a greater rate by contact than in any other manner; therefore for fast heat exchange it is advisable to have mass flow contact and velocity flow contact. Fig. 5 illustrates this point; the data plotted represents steel air heaters of 2½-in. tubes and plate heaters of equal areas. Therefore if it is desired to use ¾-in. tubes, the volume of fluid per sq. ft. of inside heating surface area is one-third as great. The velocity contact flow is increased three times. Recent tests have shown that double the velocity of contact flow increases the heat exchange 38 per cent although the same mass flow contact is maintained. Therefore, if velocity contact flow is tripled the rate of heat transmission given in Fig. 5 is multiplied by 176 per cent.

This practical data seems to confirm the work of some early investigators who found that the "K" coefficient for heat exchange varies with some power of the velocity. This was shown as equivalent to K multiplied by the square root of the velocity, or heat transfer = $K\sqrt{v}$, or $100\sqrt{3} = 173$ per cent.

The control of man over pressures and temperatures places a great period of development before him. By putting a pressure of 20 atmosphere into an arc light, the temperature is raised from 7000 deg. F. to 14,000 deg. F., or comparable to that of the sun. The application of such temperatures under pressure is not the concern of this article, but attention can be directed to the pressure on gases to increase the density and mass flow contact, where the air is under 15 lb. gage pressure and absorbs heat at twice the normal rate. If the pressure is dissipated by friction to one atmosphere the absorption is one and one-half. In the case of employing ¾-in. tubes compared with 2½-in. and reducing the pressure by friction from 15 lb. to atmosphere, the gain in heat exchange may approximate 72 per cent. Thus, with the addi-

tion of this pressure the rate of heat transmission given in Fig. 5 is multiplied by 248 per cent.

The advantages of steel recuperators and rotary melting furnaces for short time melting, using oil firing are indicated by the following table:

Minutes Furnace Lighted	Air Temp., deg. F.	Gas Temp., deg. F.	Tube Temp., deg. F.	Exit Gas Temp., deg. F.
	500	356		
13	698	572		
23	896	698		
30	1040	734		
42	1184	842	1652	
54	1292	860	1742	1200

Heat recuperation, and dry dust extraction for the raw gas coming out of the blast furnace at 500 deg. to 700 deg. F. carrying 10 grains or more of dust per cu. in., can be done in a single unit shown in Fig. 7. It is suggested that the combination steel heat recuperator and dry dust extractor be placed in down-comers from the furnace for preliminary air heating and 85 per cent of the blast furnace dust extraction. From this apparatus the hot gas with 15 per cent of dust can be burnt in metallic hot stoves, where more dust can be collected. Metallic stoves are not subject to dust troubles in the same manner as the Cowper type.

As is known, blast furnaces had iron blast stoves in the days when a preheated blast was first used. These stoves contained wide tubes of cast iron, but, as cast iron scales at red heat and also narrow tubes could not be made with a favorable ratio of surface to cross-section, only blast temperatures up to 840 deg. F. could be obtained. A tremendous advance was achieved by the invention of the brick blast stove by E. A. Cowper, a collaborator of Sir William Siemens. It was no easy matter for the metallurgists of the old days to work with the Cowper stoves and it was a long time before the difficulties were overcome by improving the design and employing cleaned blast-furnace-gas as the heating medium.

Metallic hot blast stoves for blast furnaces have been in service for more than a year at the Röchling Works (Saar) Germany, where one stove supplies the hot blast to a 500-ton per day furnace producing pig iron from oolitic iron ore and sintered flue dust. This stove is built according to the principles outlined in Fig. 3.

The steel vertical tube hot stove shown in Fig. 8 consists of three nests of tubes 44 ft. long, suspended vertically and counter-weighted to allow free expansion without deformation if overheated. The stove is fired by four burners, two to each firebrick combustion chamber. The fuel consumption approximates 176,757 cu. ft. of blast furnace gas per hr. with 158,900 cu. ft. of air for its combustion at a temperature of 2012 deg. F.

TABLE I
Comparison of Cowper and Metallic Stoves

	Cowper Hot Stove	Steel Hot Stove
Number of units per Furnace (no reserve)	2	1
Height of chimney	121 ft.	59 ft.
Base area	2472 sq. ft.	1553 sq. ft.
Weight of bricks	3700 tons	150 tons
Weight of iron and steel	230 tons	200 tons
Heating surface	197,440 sq. ft.	19,368 sq. ft.
Efficiency	77 per cent	82 per cent
Costs	$200,000	$160,000

This temperature is diminished just before the gases enter the tube banks by passing them through a screen, or auxiliary radiant heat absorbing surface, thus protecting the tubes from the direct radiant heat from the furnace. The tubes are "U" shape and receive 8 per cent of the total air "cold," which assures proper metal temperatures. About 92 per cent of the air to be heated, 1,871,695 cu. ft. per hr., enters the stove at its top and passes downward inside the tubes, while the hot gases travel upward, taking a zig-zag flow over the outside of the tubes, being deflected by baffles. Each nest of tubes has independent free expansion and is divided into two parts at the top, or six parts in all. The tubes are made of different kinds of steel, welded together. The nests at the bottom are of chromium-nickel steel while the six at the top are made of mild steel. The tubes are welded into headers, the bottom headers are welded chromium-nickel steel and the six at the top are of mild steel.

The designers experienced some little difficulty in calculating the stresses for the maximum blast pressure of 15 lb. per sq. in. gage, with a metal temperature around 1832 deg. F.

The steel hot stove is equipped with all up-to-date instruments for the read-

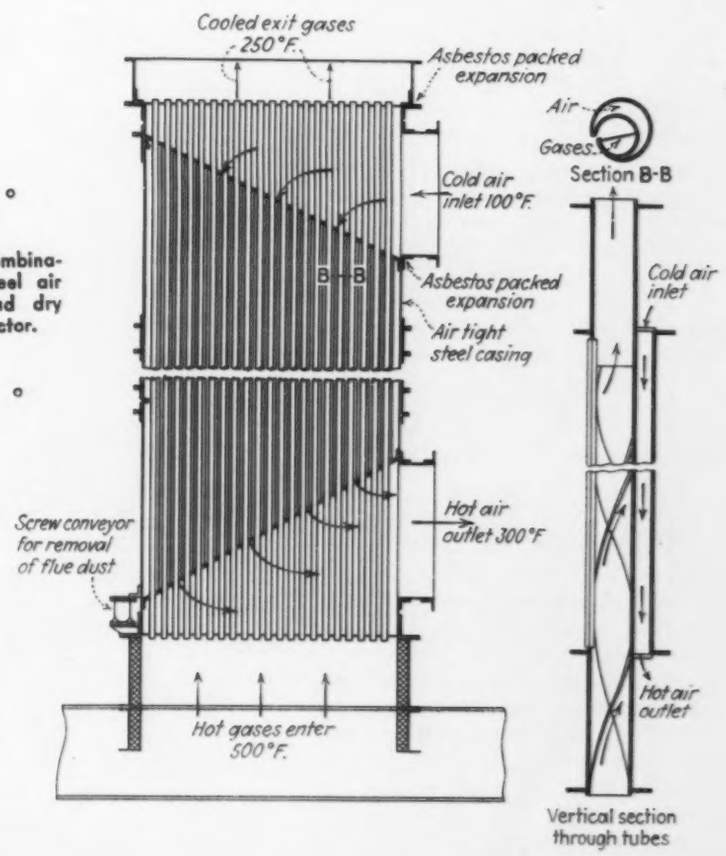

FIG. 7—Combination of steel air preheater and dry dust extractor.

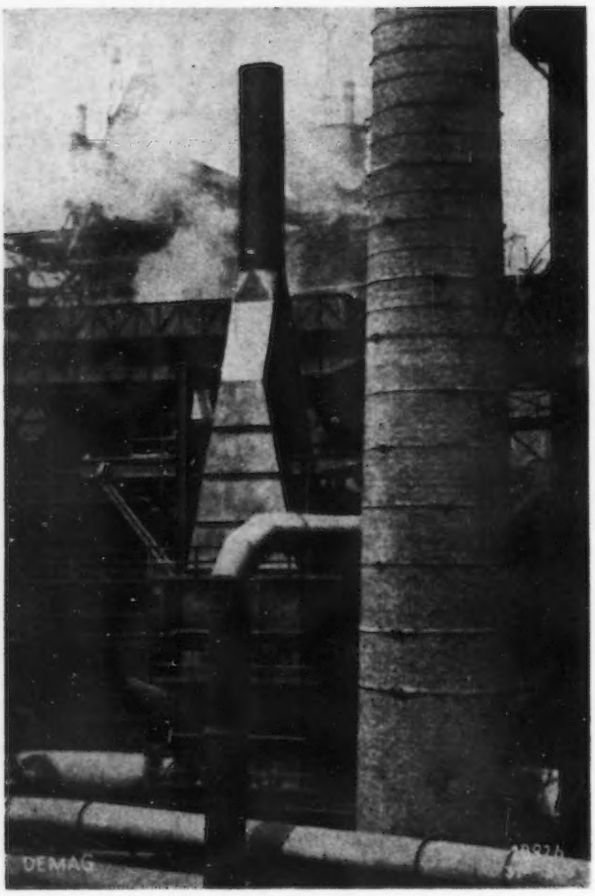

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FIG. 8 — Steel recuperator at a blast furnace with a daily production of 500 tons at Volklingen (Saar).

o o o

ing of pressures, temperatures and flow, together with all the regulating devices which are employed today for metallurgical furnaces. The temperature of the blast may be changed to the desired conditions very quickly, this regulation being made at the blast furnace floor by simply setting the pointer on a temperature regulator. The supply of gas and air for combustion at once follows, automatically adjusting itself to the new temperature to be maintained. The recuperator operation is entirely automatic, with results obtained without delay because of the low-heat storage characteristic of metallic stoves.

A comparison between a Cowper type with a steel hot blast stove for a 500-ton capacity per day blast furnace is tabulated in Table I.

The Velox steam generators burning blast furnace and coke oven gas have shown remarkable results, particularly in their ability to burn blast furnace gas at 82.4 to 86 per cent thermal efficiency and to meet fluctuating loads quickly without an appreciable drop in thermal economy.

These results have suggested further application of the Velox principle for the heating of blast for blast furnaces. However, as the temperature of combustion at high pressure would prove too high for the air-heating surfaces under pressure, a Velox steam generator would be used as a combustion chamber and so proportioned that the gases are cooled to 1780 deg. F., after which they pass into the second stage blast heater, where the gas temperature is diminished to 930 deg. F.

The preheated air leaving the second stage attains a temperature of 1200 deg. F. before it is delivered to the blast furnace.

The gas at 930 deg. F. and under pressure continues to the gas turbine, driving the air and gas blower for the auxiliary boiler unit. The temperature drop in the turbine would be roughly 180 deg. F., and the gases exhausting from the turbine would then pass to the first stage blast heater where the air is preliminarily heated from 210 deg. F. to 530 deg. F. The gas would leave the hot blast machine by the stack at a temperature of roughly 300 deg. F.

With the proposed inlet gas temperature into the second stage stove of 1780 deg. F. and a final blast temperature of 1200 deg. F., the maximum mean wall temperature in the tubes would be 1490 deg. F. This temperature is quite permissible with the present day high temperature alloy steels which are available. If it is required, the all-metal stoves can be designed for a hot blast temperature up to 1550 deg. F. It is not proposed, at present, however, to go any higher than this, and for most blast furnace plants this temperature will suffice.

It should also be noted that the air and gas pressures are low, and are furthermore practically equal. Consequently, the tubes will only be subjected to heat stresses and these are very low in the case of thin-walled tubes such as would be used for these stoves.

There are two important factors which determine the economic possibilities of the all-metal stoves.

(a) The use of the "Velox" steam generator to bring down the gas temperature without loss of efficiency to a point where it can be used safely in a metal stove.

(b) High gas and air velocities, approximately 200 ft. per sec. By this means a higher rate of heat transfer is obtained and, consequently, the dimensions of the stoves become comparatively small. This simplifies construction and reduces the cost to only a fraction of that of a standard brick stove.

Zinc Group Protests Cut in Import Duties

THE American Zinc Institute, representing 95 per cent of the spelter mining, smelting and manufacturing industry in the United States, has filed a protest with the State Department against the tariff concessions granted on zinc ore and slab zinc in the recently signed trade agreement with Canada, uring that the new concessions be withdrawn.

According to the institute, the injurious effects of the agreement have already become apparent in the unsettling of the domestic market, in threatened shutdowns of mines and smelters and in prospective wage reductions and layoffs of employes. Since the announcement of the trade agreement, ore prices have declined $5 a ton and slab zinc $11 a ton. The new concessions, the institute states, invite importations from all foreign producers except Germany, due to the favored-nation clause written into the agreement.

Magnesium Foundry Practice[1]

o o o

By W. C. DEVEREUX[2]

o o o

THE main advantages arising from the use of magnesium alloys result from its low specific gravity of about 1.8, compared with 2.8 for aluminum and about 7.2 for steel. Although frequently classed together as light alloys, magnesium and aluminum differ in certain essential features from the standpoint of the foundry, the chief difference being the extreme combustibility of the molten magnesium and the rapidity with which it will react with moist sand.

Melting Practice

The development of a technique for the satisfactory melting and casting of magnesium is therefore centered around these peculiarities although, as in the case of aluminum, the lightness of the alloy combined with a tendency to form unsound castings has to be taken into account.

Magnesium is usually melted in steel crucibles in oil-fired furnaces although coke furnaces are sometimes preferred. The steel used for the crucible has been the subject of some considerable investigation since it is found that mild steel does not withstand the action of the fluxes and deteriorates rapidly. In choosing a heat resisting steel it is important that the steel should have a low nickel content on account of the marked tendency for magnesium to absorb nickel from the crucible. Chromium and cobalt are not easily absorbed. It is possible with extreme care to melt magnesium in a crucible with a closely fitting lid without the use of a flux, depending on an atmosphere of sulphur vapor for protection against oxidation. This method is, however, unsatisfactory since it results in dross inclusions and blowholes in the casting. Superior results have been produced by the use of fluxes.

German Melting Procedure

In order to produce satisfactory castings, free from dross and flux, the choice of flux and the method of procedure call for the exercise of considerable discretion. In this respect it should be noted that the German, British, and American practices, although fundamentally similar, differ in some important details. In the German practice two fluxes are used (British Patent No. 219,287), one having a relatively high and the other a low melting point. The procedure adopted is as follows: During melting a sufficient quantity of the low melting point flux is introduced to prevent oxidation and when the metal is completely molten a further quantity is added and the whole stirred in order to remove oxide inclusions from the liquid metal. The flux is then cleaned off and a quantity of the high melting point flux added, the metal heated to a temperature of 1470 to 1560 deg. F., and then cooled to the casting temperature which is approximately 1290 to 1330 deg. F. The object of the pre-heating before melting is to refine the grain size of the final casting.

In the British practice one flux only is used (British Patent No. 427,316), this flux having the property of fusing readily when added to the molten metal and then caking to form a hard crust which is easily removed prior to pouring.

Green Sand Castings

When molten magnesium comes into contact with moist sand it will react immediately and vigorously and for this reason in the early days of its development, sand casting of magnesium was extremely difficult and had to be carried out in baked molds. At the present time, however, it is possible to make satisfactory castings in green sand by the use of inhibitors which are materials added to the sand to prevent burning of the magnesium. In the German practice, sulphur (5 to 10 per cent,) and boric acid are added to the sand. This mixture is extremely effective. In the British practice ammonium-bifluoride is used and when the molten magnesium comes into contact with sand containing this fluoride a coating of insoluble magnesium fluoride is formed on the metal and this has the effect of preventing burning and corrosion. A considerable effort has been made by various in-

[1] Abstract of a paper presented at the Polish International Foundry Congress and originally published in *Foundry Trade Journal*.

[2] Mr. Devereux is managing director of High Duty Alloys, Ltd., and Magnesium Castings & Products, Ltd., Slough, England, and director of Reynolds Rolling Mills, Ltd., Birmingham, England.

vestigators to discover other more efficient inhibitors and although such materials as ammonium boro-fluoride, naphthalene, resinous oils and volatile hydro-carbons and certain alkaline sulphites have been found effective they have not yet reached the commercial stage.

Sand Preparation

For the manufacture of sand castings in any metal or alloy the selection of a suitable molding sand is a matter of considerable importance. In the case of magnesium alloys it is essential that the correct type of molding sand be chosen. Many foundries casting the heavier metals, and even some foundries casting aluminum alloys, use natural molding sands. These natural sands are sand mined or quarried from a particular sand pit and are of such composition that they contain a percentage of clay or other bonding agent. These sands are prepared for foundry use by milling and mixing with a certain percentage of used floor sand. Often little consideration is given to the physical characteristics of such sands. If the castings produced from them have a smooth finish and are free from scabbing and surface blowholes the foundries are usually satisfied with these sands as molding materials.

In the case of magnesium, several factors have to be taken into consideration which are not of such great importance in the founding of heavier metals.

The first of these to be considered is density. Molten magnesium at a temperature of 1290 deg. F. has a density of only 1.54. Owing to this it is of primary importance that any

TABLE I—COMPRESSION STRENGTH OF BENTONITE-BONDED SANDS

Synthetic sand	Soft ramming, Lb. per sq. in.	Medium ramming, Lb. per sq. in.	Hard ramming, Lb. per sq. in.
96 per cent silica sand.. 4 per cent bentonite	1.4	3.1	3.1
94 per cent silica sand.. 6 per cent bentonite	1.6	2.2	3.3
92 per cent silica sand.. 8 per cent bentonite	2.2	4.0	5.1

TABLE II—INFLUENCE OF IRON OXIDE ON GREEN BOND STRENGTH

Synthetic sand	Soft ramming	Medium ramming	Hard ramming
96 per cent silica ... 2 per cent bentonite. 2 per cent oxide ...	1.0	1.4	1.8
95 per cent silica .... 2 per cent bentonite. 2 per cent oxide	1.1	1.9	2.1
94 per cent silica .... 4 per cent bentonite. 2 per cent oxide	1.9	3.1	4.0
92 per cent silica .... 4 per cent bentonite. 4 per cent oxide	1.2	3.3	4.6
92 per cent silica .... 6 per cent bentonite. 2 per cent oxide	2.9	4.7	6.5

gases contained in the mold, such as air, water vapor or hydrogen, formed by the reaction of the molten magnesium with water vapor, have free exit from the mold. As such exit cannot be provided by the use of risers and vents alone, it is therefore essential that the sand used has a high permeability value in order that the mold gases can readily escape. With natural molding sands this permeability value is generally low. If such sands were used for magnesium casting, especially in the green state, the resultant castings would contain many surface blow-holes which would be revealed on machining. In order to avoid this difficulty, synthetic molding sands are used. By the use of such a sand it is possible to control the most important factors, such as permeability and moisture content, by frequent checking with suitable apparatus. Such synthetic sands are obtained by mixing a selected grade of dry silica sand and adding thereto a specific quantity of suitable binder.

Sand Preparation and Control

For preparation for magnesium foundry purposes the silica sand would be mixed with a colloidal clay binder. Bentonite has been found to be suitable, the amount necessary to obtain a suitable bond being approximately 4 per cent. This mixture is moistened with 4.5 per cent of water while being milled in a suitable sand mill. The permeability value of this synthetic sand would be between 140 and 170 c.cs. per min. Sands having a low permeability value are generally unsuitable for magnesium founding.

Synthetic molding sand with 4 per cent clay binder contains only 4 to 5 per cent water. This amount is rigidly controlled as any excess of water in a green sand mold for magnesium casting would have disastrous results.

Experiments have been made to determine the optimum amount of clay binder necessary to obtain a suitable green bond strength. Test samples have been rammed in a standard rammer of the same type as that used for preparing the sample for permeability

TABLE III—MECHANICAL PROPERTIES OF VARIOUS MAGNESIUM ALLOYS

	10 per cent Al. 0.2 per cent Mn. Remainder Mg.		8 per cent Al. 1 per cent Zn. 0.3 per cent Mn. Remainder Mg.		6 per cent Al. 3 per cent Zn. 0.3 per cent Mn. Remainder Mg.	
	As cast	Solution treated	As cast	Solution treated	As cast	Solution treated
Proof stress 0.1 per cent, tons per sq. in.	4.5 to 5.5	5 to 6	4.5 to 5.5	4.5 to 5.5	4.5 to 5.5	4.5 to 5.5
Ultimate stress, tons per sq. in.	8 to 10	14 to 16	9 to 11	14 to 16	9 to 11	14 to 16
Elongation on 2 in., per cent	1 to 3	7 to 9	3 to 5	9 to 14	5 to 5	8 to 10
Compression strength (ultimate), tons per sq. in.	22 to 24	23 to 25	22 to 24	24 to 26	23 to 25	21 to 23
Compression proof stress, 0.1 per cent, tons per sq. in.	6.5 to 7.5	5.5 to 6.5	5.5 to 6.5	4.5 to 5.5	6 to 7	4.5 to 5.0
Fatigue range (20 million reversals) (plain bars), tons per sq. in.	± 5.7	± 6.0	± 5.0	± 5.0	± 5.0	± 5.0
Brinell hardness (500 kg., 10-mm. ball, 30 secs.)	55 to 65	55 to 65	50 to 60	50 to 60	50 to 60	45 to 55
Specific gravity	1.81	1.81	1.81 to 1.83	1.81 to 1.83	1.83	1.83
Thermal conductivity (C.G.S. units at 18 deg. C.)	0.32	0.31	0.32	0.30	0.32	0.32
Coefficient of thermal expansion (cms. per deg. C.) (average):						
20-100 deg.	23.9×10^{-6}	23.9×10^{-6}	25.6×10^{-6}	25.6×10^{-6}	25.6×10^{-6}	25.6×10^{-6}
20-150 deg.	25.0×10^{-6}	25.0×10^{-6}	26.3×10^{-6}	26.3×10^{-6}	26.3×10^{-6}	26.3×10^{-6}
20-200 deg.	26.0×10^{-6}	26.0×10^{-6}	27.1×10^{-6}	27.1×10^{-6}	27.1×10^{-6}	27.1×10^{-6}

determinations. The samples in cylindrical form were placed on the pan of a British Cast Iron Research Association compression testing apparatus, and pressure applied by means of a screw thread. The load in pounds was noted when the specimen crushed and this value converted into pounds per sq. in. Table I gives comparative values for various percentages of clay binder. These values are for the equivalent of soft, medium and hard ramming. In each case the percentage of moisture is constant at 4 per cent.

In general, a synthetic molding sand containing between 4 and 6 per cent of clay binder constitutes a suitable molding material for magnesium founding. It is found that with percentages above 6 per cent the sand tends to become sticky. This sand, however, suffers from one marked disadvantage in that it cannot be skin dried, as the face of the mold readily becomes friable. Another disadvantage is that during hot and dry weather the sand rapidly air dries and is somewhat more difficult to handle. Some experiments have been carried out with the addition of hydrated iron oxide to the silica clay mixture. The addition of this compound has the effect of markedly increasing the green bond strength and at the same time allowing the mold to be skin or completely dried without crumbling, and rendering it less susceptible to the air drying effect. Some values for bond strength with the addition of iron oxide to the synthetic sand are given in Table II.

It has been found that some of the latter mixtures are too strong for ordinary molding purposes and a mixture with 94 per cent silica sand, 4 per cent bentonite and 2 per cent hydrated iron oxide is the most satisfactory.

While it cannot be stated that these mixtures fulfill the ultimate requirements of a molding sand for magnesium alloys there appears to be a definite advantage in the addition of hydrated iron oxide to a mixture of silica sand and colloidal clay.

TABLE IV—MECHANICAL PROPERTIES (SOLUTION AND PRECIPITATION TREATMENT)

	10 per cent Al. 0.2 per cent Mn. Rdmr. Mg.
Proof stress, 0.1 per cent, tons per sq. in.	7.0 to 9.0
Ultimate stress, tons per sq. in.	15.0 to 17.0
Elongation on 2 in., per cent.	1 to 3
Compression strength (ultimate), tons per sq. in.	27 to 29
Compression proof stress, 0.1 per cent tons per sq. in.	9.5 to 10.5
Fatigue range (20 million reversals) (plain bars), tons per sq. in.	± 5.0
Brinell hardness (500 kg., 10-mm. ball, 30 secs.)	75 to 85
Specific gravity	1.81
Thermal conductivity (C. G. S. units at 18 deg. C.)	0.32
Coefficient of the thermal expansion (cms. per deg. C.) (average):	
20–100 deg.	23.9×10^{-6}
20–150 deg.	25.0×10^{-6}
20–200 deg.	26.0×10^{-6}

Mechanical Properties

Compared with aluminum alloys it may be said that cast magnesium alloys possess a lower proof and relatively high fatigue strength. The low proof stress is coupled with moderately good resistance to shock and the alloys are therefore quite suitable for components which are not subjected to continuous high stresses, and are eminently suitable for structural parts subjected to temporary loads of a high order. In view of the good fatigue properties of the alloys it would be expected that they would be suitable for the construction of components subject to high fatigue stresses, but, as previously pointed out, they are prone to shrinkage porosity which is generally located at changes in section. This defect, inherent in magnesium castings, would be best overcome by close co-operation between the foundryman and the designer directed toward producing a casting free from those peculiarities which tend to cause porosity at the most highly stressed parts.

The mechanical properties of the three alloys most widely used are given in Table III.

Each of the alloys detailed in Table III is amenable to heat-treatment and may be used either in the solution treated condition or after double treatment (solution treatment followed by precipitation hardening).

Some of these alloys may also be hardened by precipitation, as shown in Table IV.

The heat treatment of magnesium, which in the case of the binary alloys with aluminum consists of maintaining the alloy at 790 to 800 deg. F. for a period of 15 to 25 hrs., gives rise to some difficulty owing to the fact that there is a tendency for the alloys to catch fire, particularly in an atmosphere of stirred air. Three methods are in use to overcome this difficulty. The German method consists of carrying out the heat treatment in a bath of mixed dichromates (British Patent No. 448,994) or in an electric furnace in which there is an atmosphere containing sulphur dioxide. In the American practice the heat treatment may be carried out in a vacuum furnace, and it is claimed that this method is completely satisfactory.

Ed. Note: For further details concerning American practice see "The Manufacture, Characteristics and Use of Magnesium Castings," THE IRON AGE, Oct. 28, 1937, page 115.

Willys Clerks Reject CIO Union, 96 to 3

TOLEDO.—Clerical workers at the Willys-Overland Motors, Inc., voted 96 to three that they did not desire to be represented in bargaining with the employer by the United Automobile Workers, which now represents production workers.

At the same election conducted by the National Labor Relations Board the maintenance mechanics and machinists voted to be represented by the Mechanics' Educational Society of America by vote of 96 to four. There were no voids, blanks or challenges in either contest.

Die sinkers at the plant recently were conceded to the Die Sinkers' Union, a division of the International Association of Machinists, affiliated with the AFL.

Labor relations have been amicable but the UAW Local 12, representing most of the 3000 or more production workers, claimed plant-wide jurisdiction.

Harnischfeger Corp., Milwaukee, has appointed the Butte Tractor & Equipment Co., Redding, Cal., as exclusive agents in its area for P&H Hansen arc welders and Smoothare welding electrodes, and has named the Dixie Mill Supply Co. with offices in New Orleans and Shreveport, as exclusive agents for those products in Louisiana.

Bethlehem Enlarges Johnstown Axle Plant

By E. F. KENNEY

Metallurgical Engineer, Bethlehem Steel Company

MANUFACTURE of axles at Johnstown, Pa., dates back more than half a century, to May, 1885, when Cambria Iron Co. started a shop equipped with two forging hammers, three cutting-off machines, three journaling machines and two shapers.

Additions to this plant have now been made through the recent completion of a large expansion and modernization program. New equipment includes an additional forging hammer, two up-to-date heat treating furnaces, and a charging machine. A modern axle finishing shop has been built—a model of efficiency—equipped with a number of new cutting-off machines and lathes.

During the first four or five years the production in the original plant was confined to 3¾ x 7 in. axles, for 40,000-lb. cars. Gradually, as the requirement for heavier rolling stock arose, larger and larger sizes were included. Today, the plant is turning out all standard and special types of axles for locomotives, passenger and freight cars, street railway cars and mine cars; armature shafts for electric locomotives, crank pins, and piston rods. Equipment is also available for overall grinding of special axles up to 16 in. diameter, and for production of hollow axles. Rounds and any type of special forgings are produced in lengths up to 126 in. and 13¼ in. diameter. A recent specialty is precision forging of axles and rounds which can be made to a tolerance approaching that of rough-turned parts.

Forging of driving axles and all special forgings is done on a 10,000 lb. or a 15,000 lb. hammer, depending on the size. These are forged directly from the heated bloom, without rolling in the round mill. A special heating furnace, with 252 sq. ft. hearth area, is used for these products. It is fired with coke oven gas, from three burners at one end, with the flue so arranged that the flame is well distributed. Temperatures are controlled by pyrometers. Blooms are charged and removed from the heating furnace with a charging machine, which permits very rapid handling of the heated bloom, from furnace to hammer, with negligible heat loss. Most of the heaviest pieces can, therefore, be forged in one operation, without reheating. This has important bearing on the quality of the forgings.

FORGING an axle bloom at the Johnstown axle plant.

Heat Treatment

The larger part of the production is machined directly after forging. However, practically all alloy steel axles and many special forgings call for heat treatment.

Two heat treating furnaces of latest type, each with 443 sq. ft. of hearth area, are used. They are heated with coke oven gas and have full automatic control, with regulation from pyrometers in each heating zone. Heat is supplied by two rows of burners, 14 on one side and 13 on the other, equally spaced and staggered and so arranged that the flame is prevented from coming in direct contact with the steel.

The temperatures used in the various treatments are governed by the analysis of the steel and the specifications. In all cases a very slow and gradual heating is observed, and the forgings are soaked thoroughly, allowing about one hour per inch diameter. A proper flame is used to prevent excessive scaling of the surface which would interfere with the quenching.

The heat treating furnaces are charged with overhead crane; the forgings roll on cast iron skids down the slightly inclined hearth toward the front of the furnace. Here they are pulled out with long hooks.

The quench tank is arranged imme-

diately in front of the furnace. The axles are dropped one at the time, on revolving rollers which are then lowered into the quenching fluid. By revolving the forgings as they go down into the fluid a more even quenching is attained. This gives uniform cooling with minimum stresses, and insures straighter axles. The forgings are kept revolving during the entire period of immersion, while the quenching medium is kept in constant motion by a circulating system.

Machining

The axle forgings are transferred from the forge shop or the heat treating department to a stock yard with storage capacity for about 1500 tons, served by two overhead cranes. From here they are loaded on transfer stock beds and taken into the finishing building by electric car pullers.

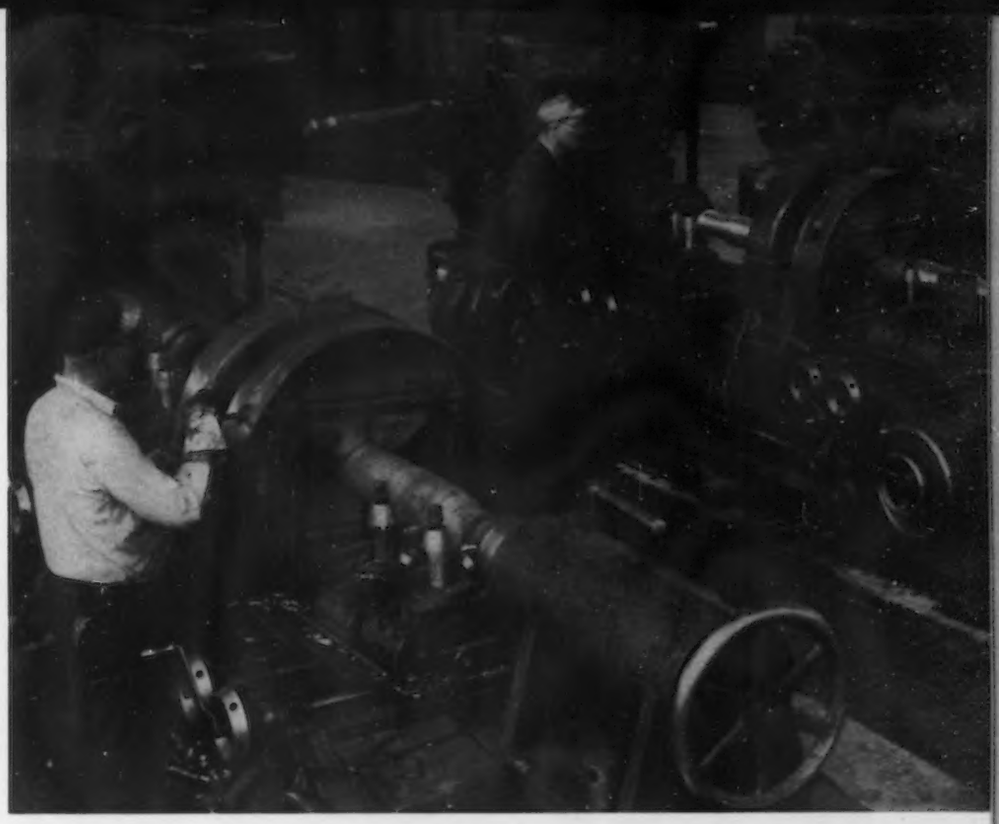
An outstanding feature in the layout of the finishing building is the arrangement of the machines in parallel rows, the full length of the building, first a row of cutting-off and centering machines, then the journaling lathes, then the shipping bed, and finally the end driven lathes. Overhead monorails for the electric hoists run above each machine, the full width of the building, except for a short distance to allow room for the crane way over the shipping bed. Each machine is equipped with its individual electric hoist, and one crane serves the shipping beds. This arrangement permits a continuous processing of the forgings, as they move from one machine to the next, on a straight line, and chances for delays and mix-ups are, therefore, minimized.

Additional finishing equipment includes a grinding machine for over-all grinding of axles for high speed passenger cars, and three boring mills, capable of boring holes up to 6 in. diameter, 126 in. long.

The building has been designed to procure maximum light and ventilation. The side walls are of brick construction with large steel sash windows; the roof is of the saw tooth type, with metal deck, insulated and water-proofed. This type of construction is suited to give an abundance of light, uniformly distributed over the entire floor area. The shop is heated with unit heaters along the side walls, arranged to give uniform heat throughout the building. During the hot season the fans may be used for cooling.

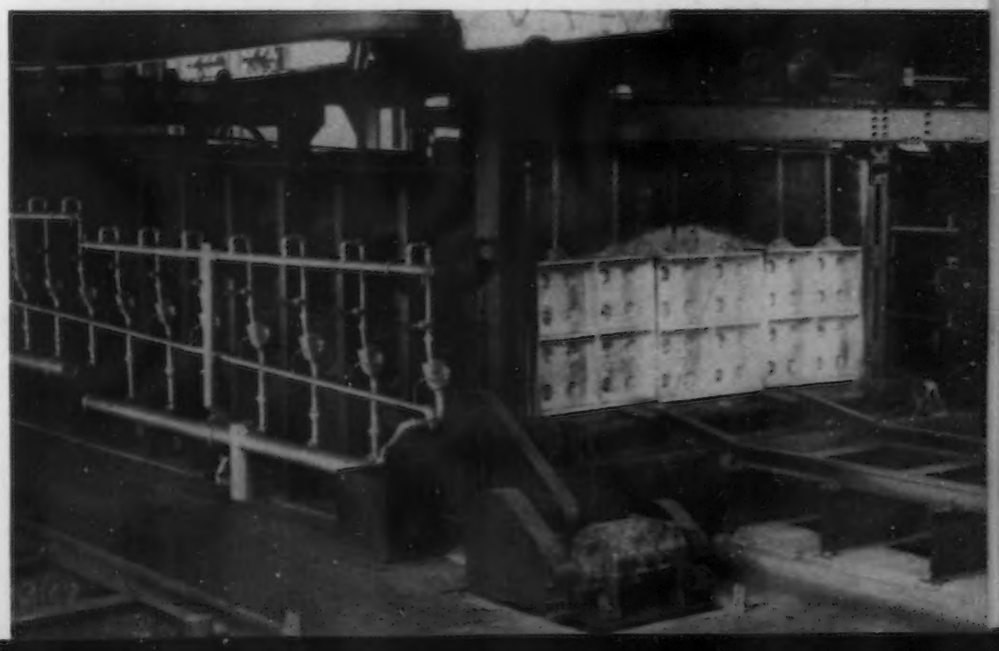
The floor is concrete, with a surface hardener to withstand heavy trucking and prevent dusting. Wooden blocks have been laid in the floor in front of all machines to provide greater comfort for the operators. In addition to the crane and the hoists, a gasoline driven forked lift truck is used for handling stock and for removing steel turnings from the scrap boxes to a pile outside the building. All products leaving the shop are carefully inspected on the shipping bed, whether mill or customer's inspection is required. Large flood lights above the shipping beds facilitate inspection.

The testing equipment includes standard facilities for the customary drop tests. For heat treated axles more comprehensive tests are made on each tempering charge. These include a tensile test, microscopic examination and frequently other tests as specified. In such cases at least 20 per cent of the forgings are made with test prolongation, and two coupons are taken from the end of each axle selected for test. One coupon is used for preliminary tests in the plant, the other for the final and official laboratory tests.

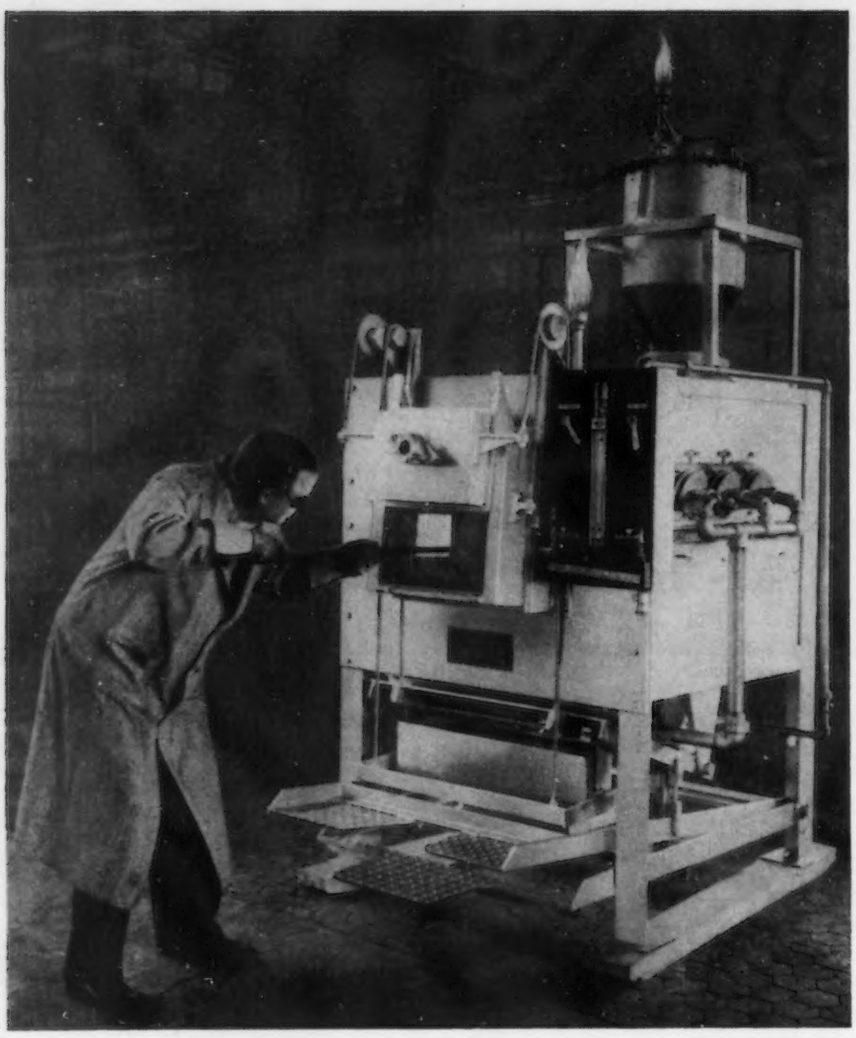


JOURNALING machines at the new axle plant. o o o

VIEW of heat treating furnace from the discharge end. o o o



New Furnace



SENSITIVE "moly" tool steels can be hardened without protective coatings in this new atmosphere gas furnace. "Soft skinning" and "surface decarburization" are eliminated.

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THE bulk of the tungsten used in such sizable amounts (12 to 20 per cent) in popular varieties of high speed steel tools comes from China, a country disorganized by war. For this reason it is of interest to examine a new piece of equipment which promises to make the industry less reliant upon tungsten steel tools and, in turn, upon the erratic supplies of tungsten ore from the Far East.

At the recent National Metal Exposition, Detroit, a new gas-fired heat treating furnace was introduced by Surface Combustion Corp., and was said to be "the first atmosphere furnace that will satisfactorily heat treat (harden) sensitive molybdenum tool steels without 'soft skinning' or 'surface decarburization.'" The equipment is called the Char-Mo furnace—"Char" because it develops its work-chamber atmosphere from reactions of air with charcoal; and "Mo" because it is specifically designed for handling "moly" steels.

The furnace's ability to simplify and improve the heat treatment of molybdenum tool steels is of importance because: (1) the "moly" steels make tools said to be comparative with tungsten steel tools—*if properly heat treated,* and (2) the largest deposits of molybdenum ore (molybdenite, MoS_2) are located in the United States.

Of course, molybdenum high speed steel tools have been known and used for some time, but up to now their heat treatment has required the use of salt baths, borax coatings, or other more or less complex procedures. Generally also, it has been necessary to grind "moly" tools after heat treatment to remove the "soft skin" caused by loss of both carbon and molybdenum at the surface. Speaking of the popular 8 to 9 per cent "moly," the Metals Handbook, 1936, says, "The advantages are lower cost, lower density, and lower required hardening temperatures. Its susceptibility to surface decarburization when treated in oxidizing atmospheres has retarded its universal acceptance." The new Char-Mo furnace was designed to avoid these heat treating difficulties.

The unit operated at the Detroit Congress was the second one ever built. "Number One" has been operating in the plant of a prominent tool steel company for three months. The two are duplicates, each having 24 x 12 x 10 in. carborundum hearths or muffles. It is understood that additional units are currently being installed in other plants, and that similar furnaces of larger sizes will be built in the near future. The furnace can be built either with a horizontal muffle or with a vertical or pit type muffle for long tools. A variety of temperature ranges also is available.

The new furnace has a refractory retort which runs vertically through the combustion chamber of the furnace at the rear. At its top is a hopper into which charcoal is fed; and at its bottom is a simple apparatus for ash removal. The same burners that heat the work heat the retort for supporting the retort reaction. Air for the reaction is tapped from the same blower which supplies air to the burners for heating the furnace, and this air is conducted through the front control panel to the bottom of the retort. About midway up the retort, in the heated zone, a small conduit takes off and connects with the muffle or hearth chamber. It is at this point that the atmosphere gas is drawn—being generated by the charcoal-air reaction. Its

Broadens Use of "Moly" Tools

"MOLY" high speed steel hardened and tempered without protective coatings in the Char-Mo furnace. Note the uniformity of structure from center to extreme edge.

composition runs about two-thirds inert nitrogen, the remainder being balanced carbon oxides in proper equilibrium for the particular application. There is never more than 3 per cent hydrogen in the muffle gas.

The retort and hopper together have a capacity of 50 lb. of carbonaceous material. Roughly one pound of charcoal is consumed per hour of furnace operation; additional charcoal need be added only every 24 to 48 hr. The charcoal price averages around 3c. per lb.

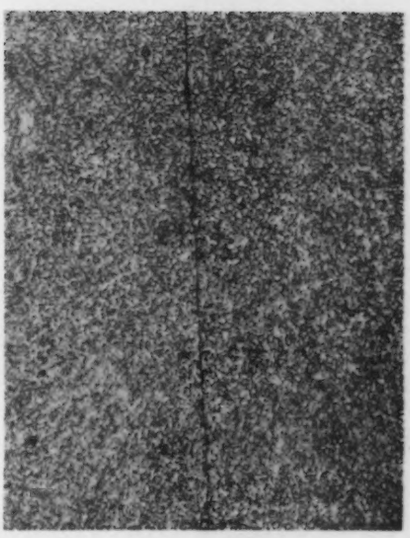
A preheating of the charcoal to drive out moisture and any higher hydrocarbons is automatically effected in the upper section of the retort, above the atmopshere take-off point. The evolved gases burn at the top of the hopper and provide the operator with a visual check upon the retort's functioning.

The atmosphere gas is fed to the muffle through the muffle back wall. It flows forward and exits in front. Thus air leakage into the work chamber is opposed. Exit atmosphere gas burns above the control panel in a small clear blue flame.

A double door arrangement indicates shrewd engineering. When the work is small, only the front and smaller door is used, and a minimum of air is admitted to the muffle during work insertion or withdrawal. When larger work is handled, both doors are raised at once to expose the larger opening. Under these conditions, of course, more air leaks in—but the work is correspondingly larger and the muffle atmosphere is purged of oxygen well before the steel reaches decarburizing temperatures. Proof of this is indicated by the change in the nature of and color of the atmosphere gas flames shortly after door is closed. Foot treadle operation of doors frees the operator's hands for loading, adjusting, and quenching assignments.

From the control panel by the door of the furnace, it is possible to adjust the rate of flow of the atmosphere surrounding the work. The composition, or carbon oxide ratio of the atmosphere gas, is determined by the temperature of the retort reaction. This, of course, can also be varied. Thus, it is possible to obtain conditions which are both non-oxidizing and non-decarburizing (either neutral or slightly carburizing as desired).

The manufacturer has stated that the use of the furnace is by no means restricted to the heat treatment of molybdenum steels. At heat treating temperatures its atmosphere is non-decarburizing and non-oxidizing for all steels*—the "moly" steels simply constituting the severest test. The furnace is said to have great utility in the general heat treatment of all classes of high carbon alloys.



CROSS-section of two samples (0.70 carbon steel) clamped together and annealed in the Char-Mo furnace. Note persistence of carbide spheroids at edges.

* An exception is steel containing a considerable amount of chromium, which, during heat treatment, may become coated with a superficial film of chromium oxide. Chromium is oxidized by pure CO.

Republic To Improve Youngstown Plants

YOUNGSTOWN.—Republic Steel Corp. recently announced a number of improvements for its plants in this vicinity. Existing normalizing furnaces will be altered to provide for higher temperatures; new apparatus will be installed for the handling of light oils from the coke ovens; a 16-in. pipeline will be constructed from the coke plant to the Bessemer plant for the transportation of gas; and additional pipe finishing machines will be provided for the electric weld department.

Recent Designs in Power

IN this review of recent announcements of the manufacturers there are described a new line of hydraulic transmissions, an automatic speed regulator for a variable-speed drive, two types of constant speed reducers, two flexible coupling designs, and belt drive equipment. Several styles of ball and roller bearing pillow blocks have been placed on the market for transmission shafting, in which particular attention has been paid to enclosures. A new type of porous, oilless bearing of lead-loaded bronze has also been developed, as well as a grease fitting for rapid lubrication of heavy machinery.

SPEED ranges as wide as 3 to 2400 r.p.m. can be obtained with the new line of oil power variable-speed transmissions recently announced by the *Sundstrand Machine Tool Co.*, Rockford, Ill. Made in sizes from 2 to 10 hp., they are said to develop high torque with smooth operation at low speeds as well as higher speeds and provide high mechanical efficiency throughout the entire speed range. Operating temperatures are low for either continuous or intermittent duty. Instant reversal may be made at high speed on continuous duty. The transmissions consist of a variable displacement, multiple-piston type pump, a fluid motor of the same type, which may be either variable or constant displacement, and a simple control mechanism, either manually or automatically operated.

Automatic Control for Variable-Speed Unit

MECHANICAL automatic control for its Motodrive variable-speed unit is announced by the *Reeves Pulley Co.*, Columbus, Ind. With the control it is possible to synchronize different machines and separate sections of a single machine, maintain constant tension and uniform winding speeds, uniform pressure, temperature and other variable elements.

On the constant-speed, motor shaft of the Motodrive is a cover plate with a lever bracket and extended lever which may be attached by cable or chain or direct to a compensating or floating roll, pressure regulator, moving carriage or other part of the machine from which indication of required speeds may be taken. Movement of the lever changes the output speed in accordance with the indicating movement, and its travel is limited by stop screws. The lever, of suitable length, can be assembled in four positions, and is applicable to both horizontal and vertical designs of Motodrive.

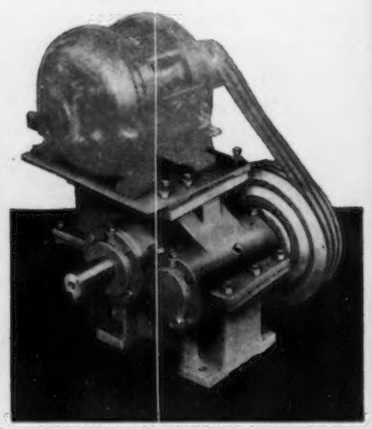
Speed Reducers

SACO is the name given a new line of constant speed, helical gear reducers recently added to the line of the *Stephens-Adamson Mfg. Co.*, Aurora, Ill. These speed reducers may be used with any standard motor to give an output speed from 13.2 to 172 r.p.m. Motor support is adjustable for V-belt drive with different sheave sizes. All shafts are mounted in precision ball bearings and the gears operate in an oil bath. Efficiency ranges from 89 to 93 per cent. The shaft support construction is said to permit a heavy overhung load.

RADICON worm reducers developed by *David Brown & Son*, of Huddersfield, England, are now being marketed in this country by *Thomas Prosser & Son*, 120 Wall Street, New York. It is claimed that

A COMBINATION of multiple piston pump and fluid motor gives this model 5HT Sundstrand oil power hydraulic transmission a speed range of 3 to 2400 r.p.m. The 5-hp. size is pictured.

AN extended lever has been added to the Reeves Motodrive to give mechanical automatic speed regulation.



THE new line of Saco constant speed reducers employs cut helical steel gears with shafts mounted on ball bearings, and provision for V-belt drive from adjustable motor.

Transmission Equipment

By FRANK J. OLIVER
Associate Editor, The Iron Age

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up to 100 per cent increase in load carrying capacity is possible through the use of a patented gear form in conjunction with special cooling methods. A fan on the projected worm shaft propels air along horizontal fins, and vertical fins are cast on the upper housing to increase the transfer of heat by both radiation and convection. A continuous oil circulating system works in either direction of rotation and provides positive lubrication for both gears and bearings. Leakage of oil is prevented by double wall oil baffles and flingers.

Magnetic Clutch

AN improved type of multiple-disk magnetic clutch of the duplex type has recently been perfected by the *Stearns Magnetic Mfg. Co.*, Milwaukee. Style ED is designed to operate two clutches, each energized by a separate magnet. By the duplex arrangement the unit can be operated in either direction simultaneously or either side of the duplex unit can operate independently of the other. There are three collector rings on the outside diameter, one ring being common to both coils. This type of clutch is particularly useful for two-speed drives, such as carriage and rapid traverse operations, reversing drives and other machine tool applications.

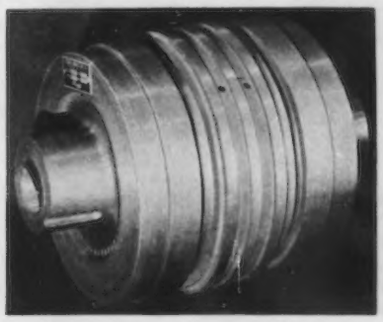
Flexible Coupling

A newcomer in the power transmission field is the *Shallcross Co.*, Forty-eighth and Grays Ferry Road, Philadelphia, which is offering the Wood flexible coupling originally developed for its own use in the manufacture of ribbon inking machines. Complete silence and long life on the hardest type of drives are claimed for these couplings, which are of the jaw type with a floating cross-shaped center member, or spider. The coupling halves are die cast Zamak metal, using set screws in the smaller sizes and standard keyways in the higher horsepowers. Also in the latter sizes, replaceable jaws are provided, made of hardened steel, canvas bakelite or rubber. The spider, which is reversible, is obtainable with driving members of fiber or hardened steel molded in rubber. In the larger powers, the driving members of the center section may also be had with replaceable load cushions of hardened steel, laminated bakelite or tire stock rubber. Neoprene can be furnished for the body of the center section at extra cost. These couplings range in capacity from ¼ to 7½ hp. at 1800 r.p.m. and in hole diameters from ¼ to 1¼ in.

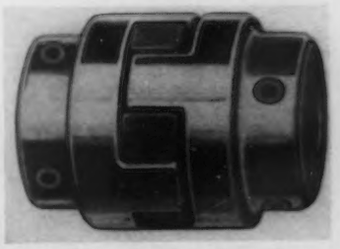
Ball and Roller Bearings

A NEW type of heavy duty needle roller bearing has been announced by the *Bantam Bearing Corp.*, South Bend, Ind. In this standard quill bearing, the ordinary assembly of outer race with hardened retaining rings has been supplanted by a one-piece, channel-shaped outer race in which a full complement of small diameter rollers is held. A spring steel band is employed to maintain the rollers and outer race during assembly, but is not called upon to carry any load while operating. Rollers are proportioned to the pitch diameter and are made with substantial curvilinear trunnions. Load capacity is said to be high, and the space required at a minimum. The bearings are available either with or without inner races to

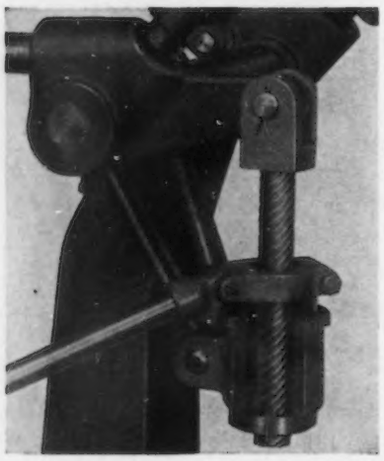
THE Radicon worm reducers have an air fan on the extended worm shaft and other cooling features to increase load carrying capacity



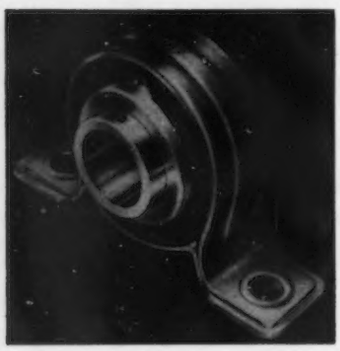
THE Stearns style ED duplex magnetic clutch is particularly adapted for machine tool component drives.



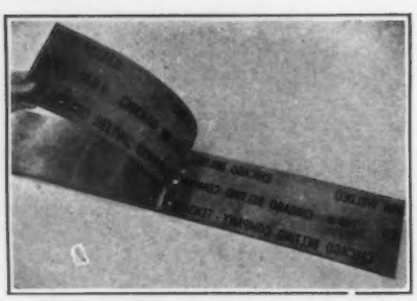
L-R type I-A Safety couplings have bodies made of tobin bronze, and a spider or resilient load cushion made from rubber, duck, leather or brake lining material of woven asbestos. The combination of materials will not spark and hence the coupling is recommended for use in explosive atmospheres. Made in standard sizes of 1 to 2¼ in. and 2 to 90 hp. at 1750 r.p.m. by the Lovejoy Flexible Coupling Co., Chicago.



THE Berkeley Engineering Co., 1581 East 17th Street, Cleveland, is offering the Tension-Trol as a readily adjusted belt tension control for cone pulleys where equal belt lengths are not possible on each step. In this device, a position-locking nut, operating on a fast lead screw, provides instant adjustment of the pulley centers and thus assures proper belt tension.

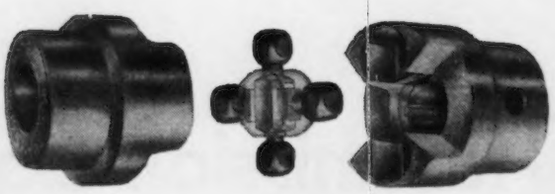


SKF Rubber-Flex pillow block is offered in ¾ and 1-in. shaft sizes for application where unusual quietness of operation is desired.

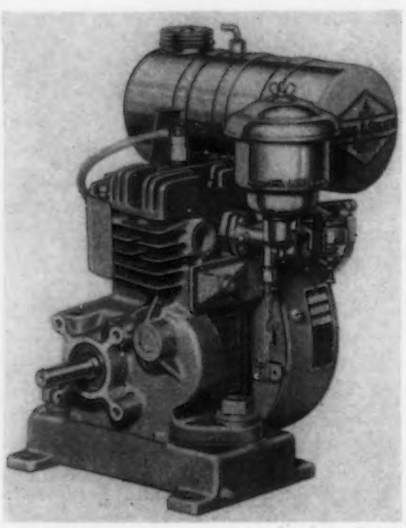


CHICAGO Belting Co., 128 N. Green Street, Chicago, now brands all its double leather belts on the inside between the plies, so that the belt can be identified years later no matter how badly worn on the outer surface. The name of maker, month and year it was manufactured is printed on the belt in multiple.

THE Wood flexible coupling has two zinc-base die cast hub members and a spider with a rubber core and various materials for driving members.

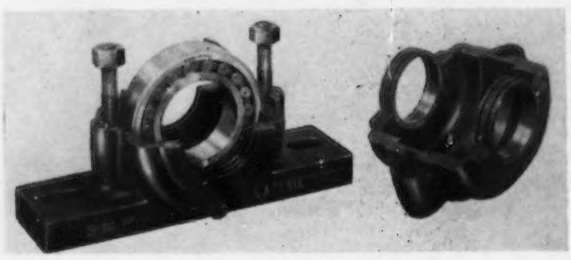


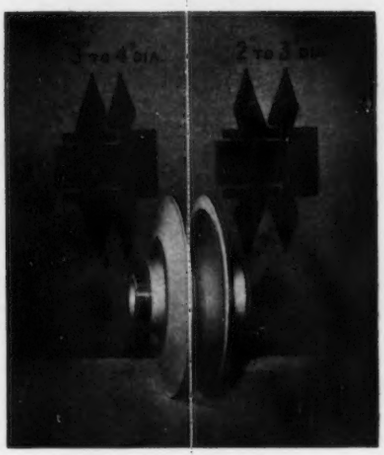
A LINE of permanently sealed, pre-lubricated ball bearing pillow blocks is being offered by Stephens-Adamson Mfg. Co. under the trade name Sealmaster.



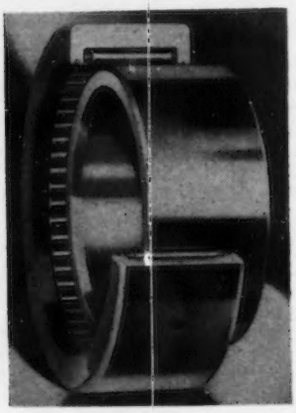
THIS new 1-hp. at 3000 r.p.m., four-cycle air-cooled gasoline motor offered by Briggs & Stratton Corp., Milwaukee, has many features of advanced automotive design: Silchrome exhaust valve with inserted seat; molybdenum alloy valve guides, aluminum alloy cylinder head, drop forged crankshaft with ball bearing and oil seal, and oil bath air cleaner. Ignition is by a flywheel magneto. The crankcase is tapped for direct mounting of equipment. Cooling is by a fan on the flywheel through housing to cylinder head. Bore, 2 in.; stroke, 1½ in.

USE of cast iron floating rings is made to form a triple seal against lubricant leakage, dust and dirt in this new type of SKF ball or roller bearing pillow block.





A COMBINATION double duty V-belt sheave is being offered by the Texrope Division, Allis-Chalmers Mfg. Co., Milwaukee. With the outer plate in the position shown at the left, the pitch diameter can be varied from 3 to 4 in.; when reversed as shown at the right, the range in pitch diameter becomes 2 to 3 in. This Texsteel sheave makes use of the Duro-Brace principle of construction.



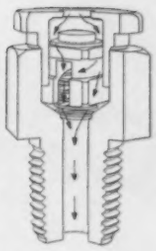
THE new Bantam standard quill bearing is characterized by a one-piece, channel-shaped outer race in which a full complement of small diameter rollers is held.

cover a range of shaft sizes from ¾ to 5 in.

SKF INDUSTRIES, INC., Front Street and Erie Avenue, Philadelphia, has announced two new housing designs in recent weeks. One is a triple seal for split pillow block housings. This seal consists of two split piston rings of cast iron on each side of the housing and grooved on the outside diameter to form a labyrinth seal with the two end bores of the housing. The rings are hammered on the outside diameter to give an inward compression to hold them on the shaft, but they are sufficiently free to locate themselves axially. Each pair of rings is mounted with the splits 180 deg. apart to prevent lubricant leakage through the splits. The inner ring serves as a flinger and the outer ring keeps dirt and other foreign substance from entering the housing. Should any lubricant pass the first seal, it is returned through a hole in the center groove of the housing. This seal is made for the complete range of standard shaft sizes.

The second *SKF* development is the Rubber-Flex pillow block, comprising a self-locking bearing of the Grip-Lock type encased in a pressed steel housing which is surrounded with an elastic material having sound absorbing characteristics. The material has been treated to make it impervious to oil and grease. The bearing itself is inherently alining and requires no machining of the shaft for mounting. The housing is equipped with felt seals to exclude dirt and is provided with means for lubricating the bearing. The whole is an inexpensive unit designed for application where unusually quiet operating characteristics are required.

PERMANENTLY sealed, pre-lubricated ball bearing, self-alining pillow blocks are being offered by *Stephens-Adamson Mfg. Co.*, Aurora, Ill., under the trade name Sealmaster. In assembly, external flinger seals are pressed onto the lands of the inner race ring and carry felt liners applied with cellulose cement. These liners travel freely in labyrinth angular grooves of inner seals pressed into the outer ring on each side. Alinement within the cast iron housing is obtained by grinding the outer diameter of the bearing proper on a spherical radius. The bearings are of the deep groove type, with the groove radius corresponding closely with the ball radius to obtain maximum area of contact. Rings and balls are made of high carbon alloy steel, hardened throughout, and ground to close tolerances. Alemite fittings are provided for lubrication.



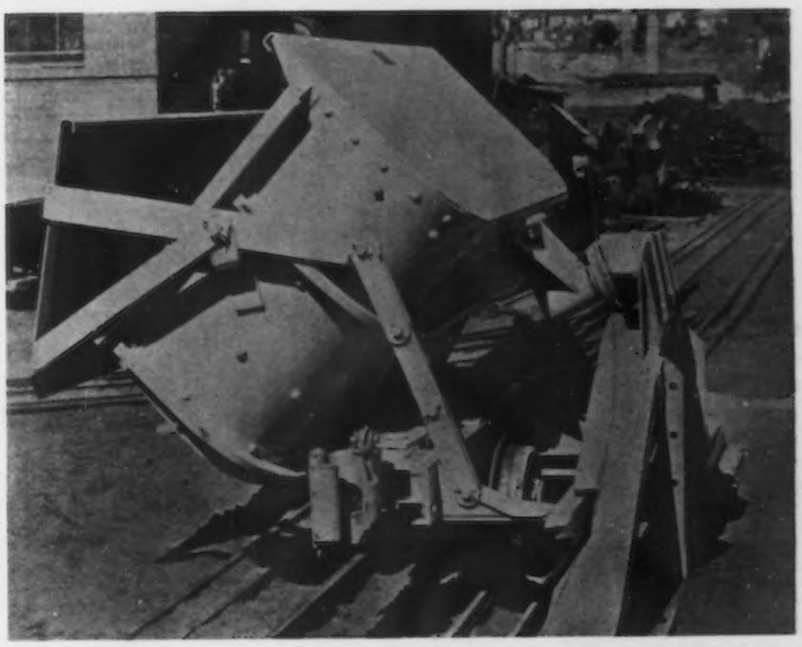
THIS new, free-flow giant Alemite button head fitting has been designed to speed up the lubrication of heavy machinery where large amounts of grease are required.

Self-Lubricating Bearing Bronze

LEDALOYL is the name given a new type of self-lubricating bearing bronze being offered by the *Johnson Bronze Co.*, New Castle, Pa. Although primarily a sintered type of bearing, Ledaloyl is said to have characteristics never before available through the process of pre-alloying the basic metals, allowing the introduction of both lead and graphite. Pre-alloying is also said to create a uniform grain structure and thoroughly homogeneous material. A definite amount of volatile matter is included in the process, producing a porous structure which will retain up to 35 per cent oil by volume, when the bearing is vacuum impregnated. The capillary structure of the bearing thus permits a flow of oil to the shaft when needed and absorption when not in use.

Large Grease Fitting

FOR rapid lubrication of heavy machinery, where large quantities of grease are used, *Stewart-Warner Corp.* has developed a free-flow Alemite button head fitting of large size. In this fitting, the usual valve core has been replaced with one having a flat face and seat, which when open offers practically no impediment to the flow of lubricant. The diameter of the valve retaining spring has also been enlarged so that the lubricant flows through the center rather than through the compressed coils. Bodies of the fitting are hardened to withstand rought usage and have smooth tops to avoid cutting the coupling sealing washer. The valve is said to open easily under slight pressure, but provides a tight seal when the pressure is removed.



REDUCTION in the dead weight of heavy mine cars has been effected by the C. S. Card Iron Works of Denver, in the construction of a number of these new self-dumping units for a large copper mining company. The mine cars weigh 3858 lb. each, a reduction of approximately 10 per cent. They are fabricated entirely of Yoloy, a nickel copper alloy steel produced by the Youngstown Sheet & Tube Co. characterized by high tensile strength and resistance to atmospheric corrosion. The mine cars are of 2½-ton capacity.

DROP FORGINGS*

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By P. ROWLEY

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THE use of metal dates back to a very early stage in the history of the human race. Probably the first metal implements were simply conveniently shaped pieces of native metal which could be used to take the place of earlier stone implements. The malleability of metals eventually became apparent and the discovery of the softening effect of heat enabled the material to be readily shaped to suit the various requirements of tools and weapons.

References by the ancient writers show that the smith was a man held in great esteem. The Romans developed the art of forging to a high degree, and the smiths of those days were highly skilled. Only in very recent years, however, have methods been devised for producing forgings in quantities, of identical shape and size. The origin of the drop forging industry in England is very uncertain, there being practically no literature dealing with the subject. However, no doubt the bicycle industry was largely responsible for its early development, and the advent of the motor car introduced patterns which were more complicated in design and larger in size than anything formerly produced. The knowledge of steels also expanded rapidly and the drop forger at a later date was required to produce parts in nickel steel, whereas his earlier products had only been in wrought iron and mild steel.

A drop forging is an article formed between dies by the flow of hot plastic metal. The names "stamping" or "drop stamping" commonly used as they are, are not strictly correct names for the type of product under consideration.

The term "drop forging" is far more descriptive of the actual process by which the article is made. The production of a drop forging involves a change of both the form and the section of the material from which it is made, whereas in the making of a stamping there is a change of form only, the original section of the material usually remaining practically unaltered.

The drop forging hammer consists essentially of two parts, a base block and a tup which may fall freely under the action of gravity, or may sometimes be assisted by steam pressure. The die blocks, in which are sunk impressions the shape of the articles to be produced, are fixed by suitable means, one to the tup and the other to the base block. The older types of hammer have the top die block dovetailed and keyed into the tup; the bottom block, which has tapered sides, is held down onto the base block by poppet pins. The majority of the newer hammers have both top and bottom blocks dovetailed and keyed. Guide rods direct the fall of the tup and means for adjusting the register of the two die blocks are provided.

The simplest and original form of hammer was the pulling hammer. This had a tup guided by slides and was raised by means of a flat steel belt fastened to the tup and running over a rotating pulley. On pulling the belt into close contact with the pulley, the tup was lifted and the removal of the tension on the belt allowed the hammer tup to fall under its own weight. The weight of a tup which can be lifted by man power is, however, comparatively small and this type of hammer has now disappeared.

When studying the development of the drop hammer the inventor, Brett, turned his attention to steam and in about 1897 he introduced the steam lift. In this type of hammer the steam is only used for lifting the tup, the fall being a free gravitational drop. The double acting steam hammer, modified to permit a greater control over the movement of the tup, and to allow for the alignment and registering of the dies, has become a serious competitor to the other types of hammer. The extra velocity imparted to the tup by the steam pressure gives a very sharp blow, but for some time it was found that the frequent breakage of piston rods rendered upkeep somewhat costly. Recently, considerable improvement in design has been made in which the piston, piston rod and tup are incorporated in one casting. The base blocks of the hammers are usually from 12 to 20 times the weight of the tup and are made of cast iron, cast steel or armour plate.

Adequate Draft Necessary

When dies are sunk for a new pattern, the first point to be considered is where to make the parting line. Very few patterns are entirely symmetrical in all planes, so that it is seldom that the impressions in the two dies are exactly alike. There are two essential points to be remembered —there must be a taper or "leave" or "draft" toward the face of the die so that the forging may leave the impression. This taper may vary from 3 deg. up to as much as 11 deg. according to the shape of the impression, the depth and the material to be forged. There must also be no re-entrant angles or cores.

The design is marked out on the faces of the dies and machining is carried out, working to templates for the various sections of the pattern. There is a great increase in the use of die sinking or profiling machines, which are automatically operated from patterns or templates. The finish must, however, be carried out by hand, and although flexible grinders are of considerable assistance this part of the die work remains one for highly skilled craftsmen.

*Abstract of lecture presented before the Staffordshire Iron and Steel (British) Institute.

Die blocks have to withstand very heavy stresses and they are, therefore, of substantial size. In spite of this, failures are fairly frequent, and some consideration of their causes will be of use. The production of a drop forging is brought about by the impact of the top die on the plastic metal which is placed over the impression in the bottom die. The first stress in the die block is due to compression over the area of contact. The other stresses set up are not quite so obvious. The center portion of the block is rigidly held in the dovetail by keys and may be considered immovable. The side portions of the block, however, are prevented from upward movement only by the faces of the tup. When the hammer falls, striking the steel between the dies, the central portion of the top die, after causing a certain amount of deformation of the sides of the die, is stopped dead for a fractional space of time. The sides of the die, beyond the material being forged, meet with no resistance except the internal resistance of the block itself and they therefore attempt to continue in motion. The result is a pivot action from the edges of the keyways to the outer portions of the block, resulting in a whip or bend. The stresses thus set up can be of considerable magnitude, especially if the corners of the keyway do not have an adequate radius. The size of the blocks used on any hammer will vary according to the pattern to be made, and after a long run a block will led into the base block leaving a depression. If the next block to be used is of larger size, there will be a lack of bearing face, and unless steps are taken to ensure a true bearing the bottom block may be broken.

To ensure a satisfactory life, a die block must be sound and free from internal defects and it must be correctly heat treated. Often insufficient soaking is given during heat treatment with the result that forging or hardening stresses are not relieved. A die block should be soaked one hour per inch of thickness. It must be capable of resisting deformation and erosion. The surface of the die, in contact with the hot steel is at the same time hardened by the hammering action and tempered by the heat of the steel being worked. Also, the metal flowing across the face of the die results in flow marks being formed. Ultimately the edges of these impressions become severely distorted.

Nickel steels are hard on dies as also are the nickel-chrome steels which are air hardening, and also the stainless steels. The die steel must have a high impact figure to enable the block to resist fracture by shock. This is particularly important in cases where the impression in the dies does not have a large margin of metal between itself and the edge of the die. The grain flow of the steel forging from which the die is made should be arranged to the best advantage. Rectangular blocks should have the grain in the direction of the keyway or longer axis, while for circular blocks the bloom should be forged to such a diameter that it requires upending and reducing by one third of its height in order to bring it to the desired diameter.

Until alloy steels came into popular use during the war, all die blocks were made from plain carbon steel, usually with a carbon content of 0.50 to 0.60 per cent. In 1925, however, specifications were drawn up to standardize the 0.50 to 0.60 per cent carbon steel, the 1.0 per cent nickel steel, the 0.50 per cent carbon low-nickel-chrome steel, and the 3.5 per cent nickel-chrome steel. Since that time many other steels have been tried and some are in common use. The first three of the original standards still maintain their popularity, however.

WHAT is the use? The "use" is a rough forging or stamping made separately to facilitate and speed up the final drop forging operation. The use shown here is a 16-in. disk. Photo by B. & S. Massey Ltd., Manchester, England. o o o

Gas Fuel Very Satisfactory

The actual type of steel to be used will depend on the size of the block and on the quantity of forgings to be produced. Where quantities are small the carbon steel block would be most economical, but large quantities will warrant the use of the more expensive alloy steels which will ensure a longer life.

The earlier furnaces used for heating steel billets for forging were simply modifications of the old blacksmith's hearth, using coke as fuel. This type was followed by coal-fired furnaces, which gave better facilities for pre-heating and soaking larger quantities of billets. When working in

conjunction with steam hammers, the furnaces are usually fitted with waste heat boilers. This makes the units self contained, but there is the disadvantage that it is difficult to satisfactorily control the firing at the same time to suit both the forging heats and the correct rate of steam raising. Fuel oil has largely displaced the solid fuels because of its ease of storage and better control in firing. A great amount of work has been done on the design of oil burners, and the latest types when used in properly constructed furnaces are very efficient. Trouble has been experienced with oil in the past, the principal reasons being due to lack of sufficient air pressure, and to the baffling of the flames before combustion has had time to become complete. Gas firing has many advantages over the other types, giving a cleaner heat as a result of the better control over the atmosphere in the furnace and a closer control over temperature. The only disadvantage of gas firing is its high cost. Unless gas of approximately 500 B.t.u. per cu. ft. can be obtained at a cost between 30c. and 45c. per 1000 cu. ft., the cost of firing is more expensive than for the other types of fuel.

Having decided on the size of billet to be used for the manufacture of a forging, the steel is heated to a forging temperature usually in the neighborhood of 1000 deg. and 1200 deg. C. A "use" or rough forging is first prepared by working the material under dummy tools, and if necessary forming under the roughing hammer to approximately the outline of the pattern. The "use" is now reheated if necessary and placed in the dies, forging being carried out until the impressions are filled and the forging is of the required thickness. During the operation a certain amount of surplus metal flows out between the dies forming a fin or "flash," and this must be removed by clipping

The bed of the clipping tool consists of a plate of steel about 2 in. thick having a hole cut out the exact shape of the forging at the die line. The bed is relieved round the hole to form a cutting edge, and is suitably hardened. A punch is made so that it presses on the forging at points where it is least likely to cause distortion. However carefully the tools are made, a certain amount of distortion does occur during flash removal and the forgings are lightly tapped again in the die to correct this. It is essential that this tapping shall be carried out as quickly as possible, particularly in the case of thin sections such as connecting rods. If tapped cold, the forging, although it has commenced to contract will be stretched again to the original die length. Not having to cool from the original forging temperature, it will not shrink to the full amount, and will result in a forging which is too long between the centers. Conversely a short forging will result if the forging be too hot when tapped.

Where much drawing down has to be done in preparing the "use" it is advisable to use square bars or billets, although the final forging may be more or less round in section. The reason for this is that as the steel is deformed under the blow of the hammer, the individual crystals are strained, slip occurring along certain planes in the crystal. Should this slip be continued beyond a certain point rupture will result. At the temperature of forging however, the crystals are able to reform and are then capable of further deformation. As long as the temperature remains high enough for recrystallization to take place, the metal will continue to flow under the hammer blows, but should hammering be continued below the recrystallization range, further hammering, if of sufficient power, will result in the fracture of the metal. If round bars are hammered between flat dies, the stresses set up are in the form of wedged rungs toward the center, having as bases the limited areas of contact with the flat of the dies. If the bars are continually turned over and struck along diameters or right angles to one another, which is the practice in "drawing down," the stresses set up around the outer shell of the bar will be of considerable magnitude causing tension at the center, the result being a capping over at the ends of the bar accompanied by a rupture along the central axis. A square bar hammered alternately on its four sides has a compressive force at its center, resulting in a greater flow at the center. The bar will therefore become convex at the ends and no central defect will be produced.

In designing drop forgings, advantage should always be taken of the grain flow of the material. The original ingot from which the billets for forgings are rolled exhibits a dendritic structure, with its primary crystals at right angles to the ingot mold faces. On rolling down to size, the dendritic structure becomes broken down and drawn out in the direction of rolling. The steel will now show a fiber or grain, especially after heat treatment, and there will be a marked difference in the Izod impact value with or against the grain. It is essential that in order that a part shall function in the most efficient manner, the grain shall be so arranged that any alternating stresses, or stresses likely to cause failure by shock, shall be exerted at right angles to the direction of the grain flow. A lever or steering arm should have the grain running along its length, and a crankshaft should be so prepared during the preliminary forging operations that the grain will follow the direction of its contours, and not cut short through the webs. Often designs are encountered in which it is quite impossible to produce the ideal grain flow, and for this reason a study of forging methods should be part of the education of all designers.

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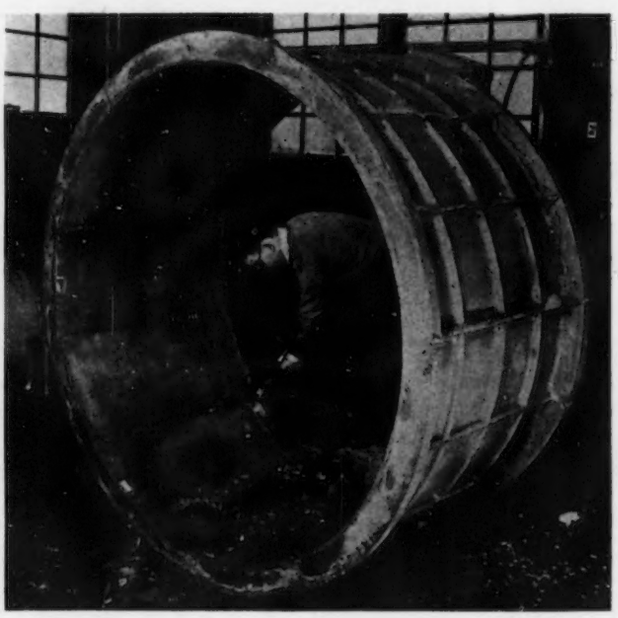

ONE of five high copper bronze ring section castings produced recently at the Milwaukee plant of the Allis - Chalmers Mfg. Co., in connection with refinery converter equipment. The outside diameter of the flange is 6 ft. 1 in., the inside diameter 5 ft. 6 in. by 3 ft. long with ¾ in. wall thickness. Approximate weight of each ring section, 3,300 lb.

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The Commercial Aspects of Stainless

° ° °

By J. H. VAN DEVENTER

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WHEN a group of industrial leaders met Dec. 13 at Pittsburgh to celebrate the 25th anniversary of the discovery of stainless steel, not all the attention was given to cheering the accomplishments of the past. History received its due but the industry likewise earnestly examined its own shortcomings, ever with an eye to its future. Some of the commercial problems—the brakes which are holding this adolescent industry back—were discussed by J. H. Van Deventer, editor-in-chief of THE IRON AGE—in an address which is here presented in full.

WHEN an engineer observes a motor car going uphill with all four brakes on at a certain rate of acceleration, it is not a matter of prophecy, so much as of mathematics and common sense, to predict its performance with the brakes released.

With its brakes released, the Stainless industry by 1947 should look forward to crossing the million ton mark in annual ingot production. This year, climbing up the final incline of the latest New Deal depression, it will probably chalk up an output of less than 100,000 tons.

A tenfold expansion of your industry in less than 10 years! Is that an actual possibility or a pipe dream? Well, if it is a pipe dream, it is a rather realistic one that is based on some sound statistical assumptions.

The evolution of every industry, indeed of every important material or product follows what is known as the "S" curve. During the period of conception and incubation, its progress is slow and the acceleration curve is almost horizontal. As technique and commercial practice gain impetus, the curve turns upward with progress increasing at a rapid rate during the period of expanding applications. Finally, as these reach the so-called "saturation point" or that of diminishing returns for effort and expenditures, the curve of progress again approaches the horizontal but at a higher altitude which is dependent upon the vertical upthrust of the development period.

Growth In Adolescence

By comparison with the human life span these stages correspond to infancy, adolescence and maturity. During the period of infancy a new industry creeps; during its period of adolescence it runs or leaps, frequently stubbing its toes and stumbling. During the period of maturity it slows down to a steady walk.

It is during the period of adolescence or expansion such as you are now in that an industry gets its growth. It is that period which determines, very largely, the soundness and stature of the industry at maturity. It is important that an industry, during this period, shall have the proper environment and be fed the proper growth vitamins. Otherwise you may find a dwarf where you should have a giant. Sometimes it is better for a new industry not to have too many uncles and aunts to prescribe its diet and teach it manners. The development of aluminum I think showed the efficiency of unified control.

The period of adolescence of a new product varies with the complexity and breadth of its potential commercial applications. The simpler these are, the shorter the period of expansion or growth. In Stainless you have what is perhaps the most complex and widespread application possibilities of any material yet discovered.

When you can plot established application points on your potentiality chart, as far apart as are a set of false teeth, the Chrysler tower, ladies' compacts, surgical instruments, teaspoons and integral parts of Boulder Dam, then you begin to visualize the vast dimensions of the uncharted areas of demand which you have yet to explore.

Tradition a Brake

It is this great variety of possible applications of Stainless that forms your present weakness and, also, your future strength, if you will take the brakes off of the industry.

One of the brakes that I believe is holding you back is your state of mind. Most of you have come up through the steel industry, have carried along its traditions and some of you seem to think that you are still in the steel business, you are not.

The fact that you named your product Stainless steel is an indication of traditional thinking. I think it would have been better for you from both producing and merchandising standpoint if you had left steel out of the name and called your product simply "Stainless."

You are making steel, but you are not selling steel nor are you competing with it. There is as much difference between what the public knows about steel and what it should know about Stainless as there is between an old-fashioned Democrat and a New Dealer.

You are not merchandising the resemblance of your product to steel, as the consuming public knows steel, so much as you are selling its dissimilarity. Stainless, so far as its applications are concerned is much nearer to the non-ferrous family than to the steel family. And this is also true of its price.

One Unnecessary Hurdle

The consuming public has had a long contact with steel and has come to regard it as a low cost material with comparatively simple qualities. Selling Stainless as steel, it seems to me and especially selling it as steel at a price level from 10 to 15 times higher, is an unnecessary psychological merchandising hurdle.

Another tradition that some of you

appear to have carried over from the steel business has to do with "tonnage" business.

Steel has always been and will probably continue to be primarily a tonnage business in both production and consumption. Stainless can be made a tonnage business in production, but it will never be primarily a tonnage business in consumption, unless you should some day get its price down to say a 2 to 1 ratio with steel. And that day, if ever, will be so far away that we need not consider it.

No matter how great your industry becomes, large tonnage orders from individual consumers will always constitute a small fraction of your potential business.

This is inherent both because of price and of the great variety of possible applications. There will always be some tonnage customers in your business and there will always be competition for their business. But if you spend too much time on this possible 20 per cent of your concentrated prospects to the impairment of your efforts on the 80 per cent more diversified group, who will buy smaller lots you will be missing a bet.

Flour Industry an Example

The problem of the Stainless industry is to convert a poundage business in consumption into a tonnage business in production. Yours is not the first industry that has faced and solved that problem.

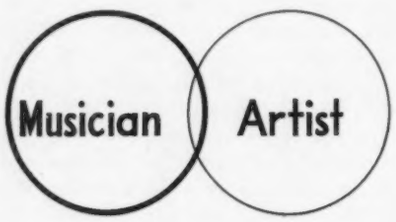
Every industry whose product caters to a wide variety of demand faces that same problem. Take the flour manufacturing industry as an example. Flour consumption is fractionalized far more than Stainless consumption ever will be. The channels of flour consumption extend into millions of households, tens of thousands of bakeries. Flour goes into a vast variety of digestible and undigestible products varying from bread to eat to paste to stick things fast with. It goes into industries as diverse as are the cosmetic and the foundry industries. And it probably undergoes more varieties of heat treatment good and bad than Stainless ever will. Flour consumption is essentially a poundage business. Yet flour-making is a tonnage business.

It is a tonnage business because the flour manufacturers have had the wisdom to apply the principle of simplification to production. If they attempted to make a special brand of flour for every conceivable use, think of the confusion and added cost that would be saddled on the industry and on its consumers.

Think what this added cost would be, for example, if the flour industry attempted to make and market 1000 different brands and compositions. What a sales obstacle it would be, for example, if they had to educate Mrs. Housewife to use flour No. 14 for cookies and flour No. 897 for layer cakes.

Simplification Ahead

It is particularly encouraging to learn, from Mr. Bergen's report, that your Metallurgical Committee proposes to do something about the more than 1000 different compositions and trade marked special brands now being offered by you to the consuming public. If you adopt the recommendations made and embark on such a program of simplification it will be a long forward step toward decreasing sales resistance. An industry which tries to create consumer understanding and acceptance of 1000 varieties of a product will not progress a tenth as fast or go a tenth as far as it would be standardizing on 30 types which will cover the lion's share of your prospective and present consumption. If, at the same time or as a succeeding step, you would also unite upon standards of shape and eliminate the multitude of special sizes that now carry extra charges, the combined effect would go a long way toward putting your production on a tonnage basis, regardless of the poundage basis of consumption. Designers and fabricators should be encouraged to use standard sizes and compositions which could be drawn from stocks held either at their own plants or at the steel plants.



I do not need to tell you what this would do to facilitate production, eliminate waste and reduce cost. But I do want so say a word or two about what it would do to lessen sales resistance and enlarge your markets.

It goes without saying that the more specific knowledge that you have regarding the advantages—and limitations — of any given material, the easier it becomes to merchandise it. This is true of different compositions of the same material and it is also true of competition between different materials.

Sales Resistance Lessened

When you once determine the supremacy area of a given composition of Stainless, in other words, the area of application in which it excels other compositions of the same metal as well as other metals, you become provided with an exceedingly valuable tool with which to reduce sales resistance.

It goes without saying, also, that whereas you might hope to obtain this knowledge with respect to say 50 standard compositions, it would be utterly impractical to do it for the almost unlimited varieties which you now make or offer.

Sales resistance and selling costs are both reduced when an individual company or an industry has the clearest possible picture of its supremacy area with respect to its competition.

In connection with this thought, I have found it useful, more than once to fall back upon a simple diagrammatic approach to the theory of competition. It applies to competition between any two or more competing factors, whether they be people or products of industries.

Consider, if you please, as a simple introductory example of this theory, these two somewhat overlapping circles. Each of them represents the capabilities of a talented woman. One has exceptional ability as a painter and the other as a musician.

These two circles interest and have a common area. In this common area each one of the two women has equal ability in cooking or dishwashing.

Develop a Specialty

If the two were to confine their efforts within the intercepted area, neither would have a competitive advantage over the other. The way for either one to develop her capabilities to the greatest profit and return on her effort is to put these efforts into the non-intercepted space. This is her supremacy area with respect to the other woman.

Now, let us proceed to the more complicated example of competition between Stainless, Aluminum and Monel Metal.

Here we have four overlapped areas instead of one. In the central area, A, all three metals, price considered, are equally suitable for a given application. In area B, Monel is out of the picture, but Stainless and Aluminum have equal competitive ad-

vantages. In Area C, Aluminum is not competing, but Stainless and Monel divide the honors. In area D, it is Aluminum and Monel.

The non-overlapping areas of each of the three circles represent the "supremacy areas" in which each of the three materials have outstanding competitive advantages.

It is three times as hard for Stainless to do business in area A, where it is on an equal footing with two competing metals as it is for it to do business in its own non-overlapped area. And it is twice as hard for it to do business in areas B and C, than it would be to work its own bailiwick. And when it comes to trying to do business in the supremacy areas of the other two metals, it is just out of luck. For while it may get that business when the other fellow isn't looking, it will not hold it.

Educate New Customers

Knowledge of the supremacy areas of your various Stainless compositions will give you the power that you need for building business. But the first practical step toward obtaining that knowledge is the drastic reduction of varieties of Stainless compositions offered. If you don't do that, you won't be able to find enough paper on which to draw all of your circles.

The education of new customers in the use of a product is a vitally necessary part of any merchandising program. It is necessary in an old industry to prevent it from drying up from customer obsolescence. It is much more necessary in a new industry where consumer acceptance has not been as fully established.

Unintelligent competition sometimes undoes, in a few hours, the constructive effort of weeks or months of acceptance building.

Let me give an illustration by citing an example from my own publishing industry, which sometimes suffers from misapplied individualism.

The sales promotion force of the "Smooth Age," let us say, spends much effort, time and money in converting Mr. X, who has never been publicity minded, to the advantages of advertising. Naturally, in so doing, they expected a contract for "Smooth Age" from Mr. X.

The Battle Is On

Word of the susceptibility of Mr. X gets abroad in the trade through the mysterious yet efficient grape-vine telegraph. He is quickly visited by the "Garb Age" salesman who tells him that the use of "Smooth Age" will be a total waste of money in solving his particular sales problem, but that "Garb Age" is made to order for it. Next comes a representative from "Dote Age" who shows a trade survey proving that "Smooth Age" and "Garb Age" are both all wet but that "Dote Age" should be first, second, third and last choice in this case. And so on through the Ages.

By the time the battle is over, Mr. X has been so thoroughly unsold on advertising and so thoroughly sold on the defects of advertising in publications that he will probably continue, for the rest of his life to use hand bills and circulars.

I wonder if you gentlemen are having the same experience in the Stainless industry? I suspect that you may be, from things that I have heard.

The attainment of your proper share of the future market naturally presupposes a gradual price reduction through the next ten years. Such a procedure will be very effective in enlarging your supremacy areas.

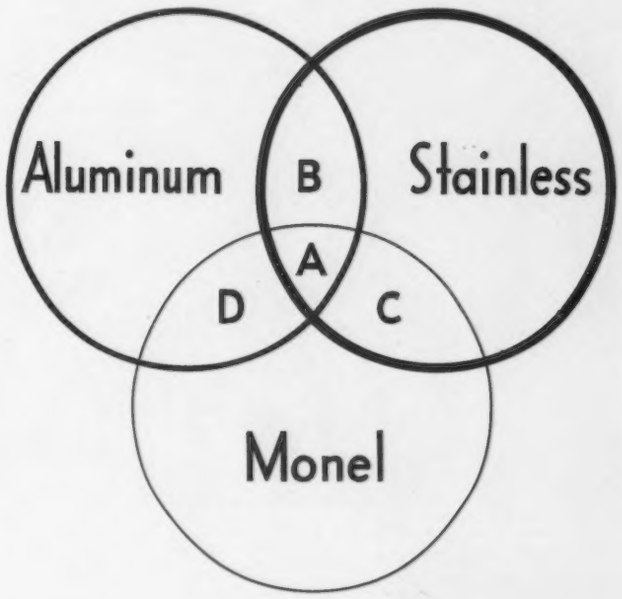
With regard to the possible cost reductions which will make such price reductions possible, you are rather fortunately situated because of the present inefficiencies in production. You are somewhat like the fellow who was warned by an abstemious friend because he drank and smoked and kept late hours. "Well," replied the sportive one, "If I get sick there are lots of things that I can give up, whereas you can't give up anything."

Price Narrowing Likely

With a spread such as you have between your ingot cost and the cost of the average finished material, there should be plenty remaining for you to give up. The simplification of compositions of Stainless, together with production shape and size standardization, would probably in itself, reduce the present spread from 30 to 40 per cent.

You probably will not realize the dream of 10c. Stainless by 1947, but with proper procedure you might well see it then at between 15 and 20c. average.

One of the brakes on your industry, I think, is the fact that you have no effective and organized means of "vestibuling" new and saleable applications through the fabricator to the consumer. Every one of you knows of hundreds of profitable applications of Stainless which would have consumer demand and which should be on the market, yet are not.



The difficulty here is that you are in the business of making metal and not in the business of making or selling the finished products of metal. The fabricators to whom you sell are not specialized makers of Stainless products and are not thinking primarily in terms of enlarging the demand for Stainless. It is a "side line" with most of them. Nor have they the knowledge and ability or the inclination necessary to make the market research that would establish a justification for going into production. And in this respect, they may also lack technical knowledge as to fabrication.

If the Stainless industry supplied the knowledge and ability, the inclination might be forthcoming.

Let me give you a simple little illustration based on fact.

Some time ago, a sportsman visited a sporting goods store in New York and inquired for a Stainless fishing tackle box. This store did not carry them and on investigation could find no one making them. Aware of the advantages of Stainless for this purpose, however, it said that they would be glad to put in a line if such were available.

Still No Stainless Box

Now you could not expect the sportsman to go out and develop a source of supply nor could you expect the store to do it. Nor could you expect any of the makers of Stainless to go into the tackle box business. And so far as I know, there is still no one making Stainless tackle boxes in spite of the fact that it is a "natural" for that purpose.

What you could expect, however, if the Stainless industry had a cooperative market promotion Institute or bureau would be that it would take cases of this kind, make the necessary market research to demonstrate a profitable market, iron out any technical difficulties that might be met in fabrication and go to a well-established tackle box maker with a case that would compel action.

I am using the fishing tackle box case merely as an example. There are many opportunities for new Stainless tonnage that are more promising.

Through this suggested cooperative vestibule, technical guidance and follow-up should extend beyond the stage of introduction of new products. If you had had such a follow-up, you would not have lost a substantial amount of the Navy business. If you had it today, you might be in better position to get your rightful share of the big future aircraft market. If you had it today you might not have seen this year's switch from a Stainless radiator shell to chrome plated steel.

Urges Study of Patents

You are in the streamlined train business largely because of a fortunate circumstance that a certain fabricator developed a satisfactory method of spot-welding your material. It is a part of your industry function to develop or help develop suitable specialized techniques which will assist fabrication and thus extend your market. Aluminum, to cite an example, has recently perfected an "impact extrusion" process which will enlarge its applications.

And now, since we are looking into the future, just one final word about patents.

I believe that it would be very much to your advantage to consider the feasibility of patent pooling and cross-licensing. Such practice is of particular benefit to an expanding industry. And I rather believe that as a result of the present "monopoly" investigation you will be likely to find yourselves pushed in that direction eventually anyway. There are some advantages in "beating the gun."

Patent pooling, in your industry, might be the means of financing the collective and cooperative activities of market and technical research which are so needed, which you cannot properly undertake individually and which would give Stainless comparable merchandising advantages to aluminum and nickel where control is more concentrated and funds more readily available.

At present you gentlemen are just scratching the surface of the field of Stainless steel. And speaking of scratching the surface, let me tell you a little story.

Lesson In Teamwork

Once upon a time gold was discovered in a certain section of a certain country. The rulers of that country, being advanced economic thinkers and wishing to distribute the new wealth as widely as possible, made an innovation in the rules concerning the locating of claims. Each claim was restricted to an area enclosed by ten foot sides, instead of the usual much more liberal dimensions.

The surface pickings were good and the locators made fair progress at working them. But pretty soon, in the natural course of events, miners came together at adjoining boundaries. Then the trouble began, for they bumped into each other and lost a lot of time arguing about the ownership of borderline nuggets.

One day along came an old sourdough who was something of a philosopher. Said he: "Boys, don't you realize that you are only scratching the surface? The mother lode is 100 feet down and it is ten times richer. Why don't you all get together and sink a shaft to the mother lode and then go your separate and more profitable ways from there?"

And gentlemen, let me in turn put this question to you. Wouldn't it be better for you and for the Stainless industry, during its period of development and expansion, if you got together to dig a shaft of market exploration which would lead you to that mother lode of consumer demand which assays at a million tons or more a year? None of you, individually, is strong enough to dig that shaft. Wouldn't that be better than scratching the surface of your individual ten-foot claims?

Sometimes it is profitable to use one's imagination in setting up an ideal picture of what a person, a product or an industry might be a number of years in the future. So in connection, let me paint an imaginative portrait of the Stainless industry of 1947.

The Stainless Mystic Ball

Gazing into the polished surface of the Stainless ball, I see an industry which has grasped its rich opportunities and has learned to separate its cooperative from its competitive functions. I see an industry which is making a million tons of ingots a year because it has realized and acted upon the need of shoulder to shoulder effort in the pioneering work of opening new fields of application. I see an industry that has been able to reduce its prices and multiply its profits because it has carried out a program of standardization and simplification of both compositions and dimensions, an industry that is doing a tonnage business on a mass-production basis instead of a poundage business on a made-to-order basis.

Gazing into this Stainless mystic ball, I see an industry whose members have come to know that they are not in competition, one with another, so much as with the more powerful natural forces of custom and inertia which hamper and slow down the consumer acceptance of new ideas; and industry whose members have pooled their collective knowledge so that Stainless may run and leap and utilize its youthful vigor without stumbling.

I see an industry which has organized to carry out cooperative effort in those branches of technical and market research which have to do with pushing back and enlarging the boundaries of application through aid in vestibuling promising new applications into production, an industry no longer content with whispering the virtues of its product but which proclaims them in collective and mighty voice from the house top.

Gentlemen of the Stainless industry, on this, your 25th birthday, I wish you well. And perhaps the best wish that I can make for you is that you may make this vision of 1947 come true.

25th Anniversary of Stainless Celebrated at Pittsburgh

(Left to Right) John H. Van Deventer, editor of THE IRON AGE; Benjamin F. Fairless (toastmaster), president, U. S. Steel Corp.; V. N. Krivobok, associate director of research, Allegheny-Ludlum Steel Corp., and L. S. Bergen, associate director of metallurgy and research, Crucible Steel Co. of America.

MORE than 100 industrial leaders gathered at Pittsburgh last week to observe the 25th anniversary of the discovery of stainless steel.

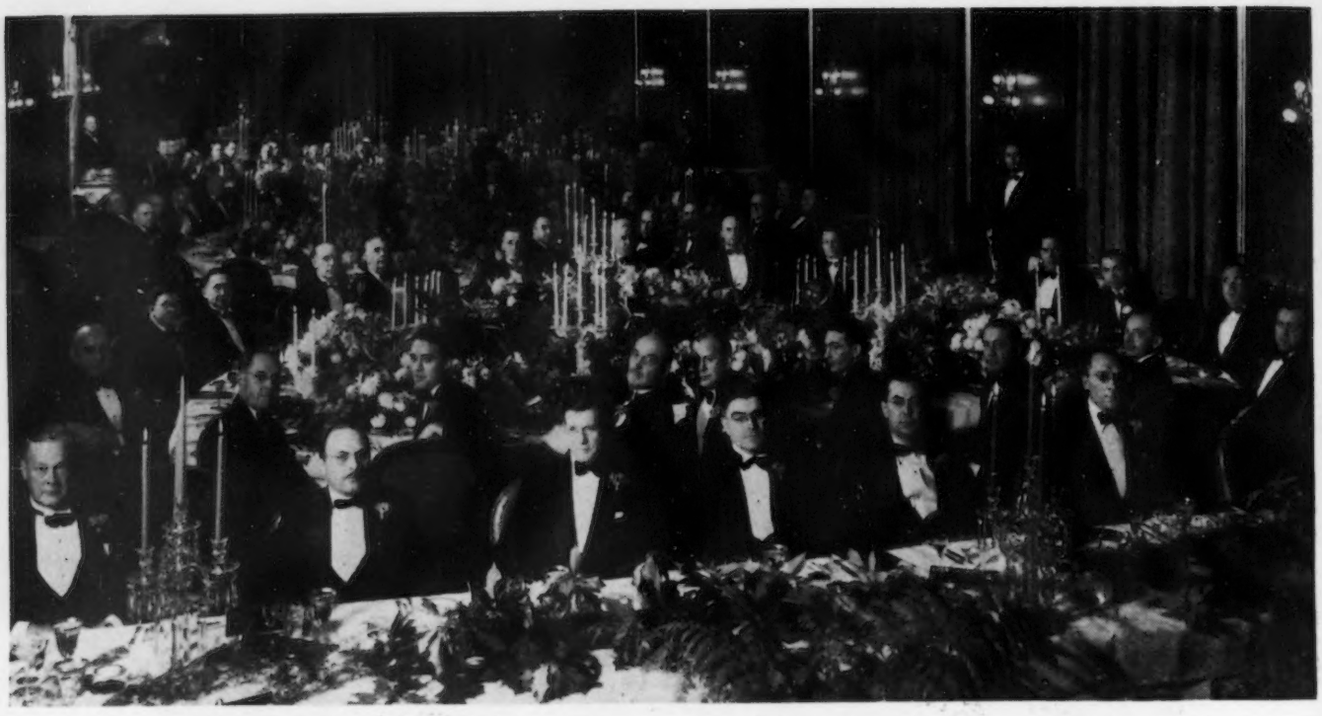
Dr. V. N. Krivobok, associate director of research, Allegheny-Ludlum Steel Corp. traced the "Origin and Development of Stainless Steel". L. S. Bergen, associate director of metallurgy and research, Crucible Steel Company of America reported on recent recommendations for standardization of stainless alloys. The commercial phase of the stainless business was discussed by John H. Van Deventer, editor, THE IRON AGE. Mr. Van Deventer's talk is printed elsewhere in this issue. B. F. Fairless, president U. S. Steel Corp. was toastmaster at the banquet.

Tracing the origin and history of stainless and going into detail on patents and discoveries Dr. Krivobok in discussing where credit belonged for the discovery said:

"From the examination of available records and official decision it becomes evident that two men, one in England, Mr. Harry Brearley, and one in the United States, Mr. Elwood Haynes, are responsible for the beginning of the era of chrome bearing stainless steel. To these two distinguished names should be added the third, that of Dr. Benno Strauss of Germany, because, almost simultaneously with Brearley and Haynes, Strauss conceived an alloy, containing not only iron and chromium but also nickel. The invention of Brearley and Haynes and that of Strauss had one thing in common—stainless properties of alloys. In all other characteristics the alloys are so different that the history of their subsequent development should be related separately.

Haynes Had Generic Idea

"The official United States Patent Office records tell us that Brearley applied for his patent on March 29, 1915, and it was issued on September 5, 1916; that of Haynes was applied for on March 12, 1915, and was issued on April 1, 1919. Incidentally, Strauss' application antidates both, being put on record on June 25, 1913. It is interesting to note that the dates of the Brearley and Haynes applications were within two weeks of each other. Whoever should be given the credit for having conceived the invention will no



The dinner commemorating the "Twenty-Fifth Anniversary of the Discovery of Stainless Steel," held at the Duquesne Club, on Dec. 13.

doubt remain a controversial matter; in view of the many years that have gone by and Mr. Haynes' departure from our planet, it should not, I feel, be stirred up again. It is believed and commonly held that Mr. Haynes conceived the generic idea: at least one may so think after the perusal of his laboratory books and after reading the main claim of his patent.

Mr. Bergen's talk dealt at length with the efforts of stainless metallurgists to reduce the number of stainless grades and bring the wide range of alloys to a state of standardization. He presented recommendations of the committee which made the study adoption of which would have a beneficial effect on the production, sales and consumption of stainless.

In discussing the need for the revisions Mr. Bergen said: "The public unconsciously thinks of stainless steel as related to almost any article that he encounters in his daily life—from a teaspoon to a railroad car. The technical engineer thinks of stainless steel as the first solution to many problems which he encounters because of the wide range of properties this product affords him.

Classification Confused

"As might have been expected, the application of stainless steel in such a comprehensive industrial development has brought about the evolution of many types suitable to specific industries and this has resulted in a multiplicity of perplexing specifications, trade names, and a flood of sometimes ambiguous semi-technical sales literature. The development has been so rapid that up to the present time it has been difficult to arrive at an orderly system of classification, even though the entire industry has recognized its need.

"There are many cases of confused overlapping of grades and types. Other cases of little used grades exist and further instances of types already appearing on published type lists can be pointed out where the alloys possess splendid properties that are too frequently unappreciated.

"The purpose of this simplification is not an attempt to eliminate types of obvious utility. However, the industry's imposing list of alloys has been viewed with a critical reasoning eye in an effort to consolidate similar and overlapping types into a single type, eliminate non-essential types, and retain those types which have proven satisfactory in their present form."

Good Supervision Seen As Labor Trouble Cure

PITTSBURGH.—"Consistent practice of good management from the top down through every level of supervision is the only sure and permanent answer to labor relation problems," William Conover, assistant director of industrial relations, U. S. Steel Corp. of Delaware, Pittsburgh, told members of the Pittsburgh Personnel Association last week.

"In reality, there is very little which must be added to the management structure and programs of a company to assure good industrial relations. There should be no necessity for an elaborate and expensive industrial relations department," he said.

Spencer Lens to Double Capacity

PRODUCTION capacity of the Spencer Lens Co., Buffalo, N. Y., will be doubled on completion of a new mechanical production unit under construction since Oct. 8 by the Gillmore-Carmichael-Olson Co., general contractors of Cleveland and Buffalo. The new unit will combine modern features suitable for a plant to house machinery devoted to precision manufacturing of light mechanical parts. The Spencer Lens Co. is the scientific instrument division of the American Optical Co., Southbridge, Mass. The structure is 210 x 420 ft. over all. The main factory will be single story.

2000 Visit New Irvin Works as Guests of Carnegie-Illinois

EXPANSION of Irvin works by additional units of production was forecast by Benjamin F. Fairless, president, U. S. Steel Corp., at the banquet commemorating the formal opening of Carnegie-Illinois Steel Corp.'s Irvin works at Pittsburgh, Dec. 15. No elaboration of this brief statement was made but it is considered logical that such expansion will probably include additional cold reduction units and accessory equipment.

The dinner climaxed a day which saw 2000 industrialists, customers, bankers and newsmen trudge five miles through the new Irvin works, where they inspected the 80-in. continuous hot mill, cold mills, sheet department, and cold reduced tin plate division.

Presided over by John Lester Perry, president, Carnegie-Illinois Steel Corp., as toastmaster and host, the dinner program included speeches by Myron C. Taylor, director and former U. S. Steel board chairman, who spoke by telephone from London; Benjamin F. Fairless, president, U. S. Steel Corp.; William A. Irvin, vice-chairman, U. S. Steel, and for whom the giant mill was named, and E. M. Voorhees, chairman finance committee. A telegram from Edward R. Stettinius, board chairman, U. S. Steel Corp., and a letter from R. K. Mellon, president, Mellon National Bank, Pittsburgh, were read.

In complimenting J. L. Perry on the Irvin mill accomplishment, Mr. Fairless challenged him and his organization "to produce material of good quality at reasonable cost . . . and to sell the product at fair prices in a highly competitive market."

Unable to be at the ceremonies, Myron C. Taylor sent his expressions by telephone from London, where he is helping to formulate plans to take care of refugees. Referring to the great number of people who made possible such a project as the Irvin works, Mr. Taylor said, "This greatest and most modern of all the steel works of the world was conceived and created to contribute to human occupation and human happiness. To repeat, it is not only a great mill—it is an example of the cooperative use of the savings of the public and of the ingenuity of the human mind in a freedom of action possible only in a free country. It is a symbol reared to the glory of unfettered human achievement—to the glory of free enterprise."

Striking a note uppermost in most

o o o

INDUSTRIALISTS, customers, bankers and newsmen get glimpse of Irvin Works 80-in. hot continuous mill.

JOHN LESTER PERRY, president, Carnegie-Illinois Steel Corp.; William A. Irvin, vice-chairman, U. S. Steel Corp., and Benjamin F. Fairless, president, U. S. Steel Corp., talking over Irvin mill opening.

people's minds today with respect to personal freedom, Mr. Taylor said, ". . . we rejoice particularly in the happy relationship which exists among all of our workers who have contributed to design, to create and to operate it. Among them are no class distinctions, no narrow religious lines of feeling, no color or race discriminations. They are a cross-section of America. They exemplify the declaration and the hope of the founders of the nation, who covenanted under God to guarantee for free men, without distinction of class, race or creed, a freedom of person and of property and a right to happiness."

Whole Program Cost $185,600,000

William A. Irvin gave the 1700 assembled guests a clear insight into fundamental policies of U. S. Steel toward expansion, production, prices, quality, and obsolescence, when he said in part, "The building of the plant which you have seen today is a part of a comprehensive general program started in 1934, which will, upon its completion, replace obsolete and less effective equipment. We have in the past five years installed continuous rolling mills for the production of flat steel products at Youngstown, Gary, Homestead, Birmingham, and Cleveland at a cost of $185,000,000. Such is the price of progress.

". . . They signify an unshaken faith in the continuing usefulness of steel in wider fields of service than heretofore. Provision has been made to serve the requirements of the consuming trade advantageously, with plants located where assembly of raw materials and cost of distribution are most favorable.

Though constructed for peacetime work and the advancement of better living, which all of us hope will never again be interrupted, nevertheless this modern plant is part of the defensive strength of our country.

Denies Unduly High Prices

"It has been said by some that in the steel industry rigid prices are maintained in the face of declining volume and that steel prices are not the result of the free play of competition. Many of us, who have been actively engaged in the production and sale of steel products for many years, know that our industry is a highly competitive one where competition materially affects prices. The proof of unduly high prices, if any, should be sought in the profit and loss statements of the steel companies.

"Comparative price figures alone do not tell the story. Improvement in quality, in strength, ductility, durability, and tolerances, has enabled fabricators to produce their products with lighter sections and greater economy. The price per ton is not the yardstick of steel prices. 'Steel' is a generic word for a thousand products for ten thousand uses.

"By reason of size these things are made possible. A certain bigness is necessary in the steel business to do the things demanded by co-related industry and the consuming public. No individual and no small group of individuals could invest the funds necessary to build and carry on the improvements required in this ever changing industry. More than 450,000 individuals own the steel business in the United States, and more than one-half million workers are employed in it.

"In this ever onward and forward march by science and industry to better ways of production and distribution, industry is compelled in the interest of economy and self-preservation to abandon old-fashioned operations at isolated high cost plants. It must concentrate activities in modern plants designed to produce in large quantity at low cost. Our industrial progress has been thus from the beginning of our history, and will of necessity continue to be so.

"All products for use by society must eventually be made where they can be produced and distributed at the lowest cost. So the competitive struggle toward progress continues to dislocate the old established order in

favor of the new. The welfare of the great majority of our citizens is involved.

"Nothing in this world is permanent. We can go back as far as history records events and movements and find an ever shifting scene."

In discussing the investment angle of the Irvin works, E. M. Voorhees, chairman, finance committee, said, "In considering the meaning and promise of our latest development in this famous iron and steel center, I am ever mindful, in line with my principal responsibility and trust, of the great investment of capital in this project, and the important considerations leading to that investment. This capital outlay must be repaid through earnings from operations, a portion of the profits going to the stockholders, and the remainder being available for investment in greater and better mills for the future. In the uninterrupted continuance of this investment cycle, lies the hope, not only for the owners of this particular mill, but also for America, for you, for me and for each one who labors."

J. F. DEASY, vice-president in charge of operations, Pennsylvania Railroad, left, tapping out "God Bless You" on the telegraphic outfit, one key of which was used by W. A. Irvin, right, when he was a telegraphic operator at the age of 13. The key was presented to Mr. Irvin, vice-chairman of the board, U. S. Steel Corp., at the opening of the Irvin Works, near Pittsburgh.

Steel Job-Sharing Aided 155,000 Workers

EMPLOYMENT policies followed by steel companies have been largely responsible for keeping on the payrolls approximately 155,000 more wage earners than would have been at work if employment in the industry had dropped as sharply as output, according to estimates of the American Iron and Steel Institute.

Production of both ingots and finished steel in the first nine months of 1938 was 56 per cent below the tonnage produced in the corresponding period of 1937. The number of wage earners employed declined only 26 per cent between the two periods, however, from an average of 521,000 for the year 1937 to 385,000 over the first nine months of this year.

If the number of men employed had fallen as sharply as production, only 230,000 employees would have remained at work.

Wages in the first nine months of 1938 were about $32,500,000 higher than the decline in output would indicate.

In the first nine months of 1938, steel employees paid on an hourly, piece-work or tonnage basis received a total of $322,227,000 in wages, or 51 per cent below the total of $658,298,000 in wages paid out in the corresponding period of 1937.

The average number of hours worked per week by wage-earning employees dropped from 39½ hours in the first nine months of 1937 to 26 hours in the corresponding period of this year. The average in October 1938 rose to 31.2 hr. per week.

Hourly earnings of wage earners in the industry over the first nine months of this year averaged 83c. per hr., as against 82c. for last year.

MONTHLY SHIPMENTS OF FINISHED STEEL PRODUCTS BY UNITED STATES STEEL CORP.—TONS

Month	1934 Shipments	1934 Per Cent of Capacity	1935 Shipments	1935 Per Cent of Capacity	1936 Shipments	1936 Per Cent of Capacity	1937 Shipments	1937 Per Cent of Capacity	1938 Shipments	1938 *Per Cent of Capacity
January	331,777	19.8	534,055	31.9	721,414	44.8	1,149,918	75.4	518,322	33.7
February	385,500	25.9	583,137	39.2	676,315	45.3	1,133,724	82.5	474,723	35.5
March	588,209	35.2	668,056	41.5	783,552	50.5	1,414,399	92.7	572,199	37.2
April	643,009	41.5	591,728	36.7	979,907	63.2	1,343,644	91.0	501,972	33.7
May	745,063	44.5	598,915	35.8	984,097	63.4	1,304,039	85.5	465,081	30.2
June	985,337	61.2	578,108	36.7	886,065	57.1	1,268,550	85.8	478,057	32.1
July	369,938	23.9	547,794	34.0	950,851	61.3	1,186,752	77.9	441,570	28.8
August	378,023	22.6	624,497	37.3	923,703	59.6	1,107,858	72.6	558,634	36.3
September	370,306	23.9	614,933	39.7	961,803	62.0	1,047,962	71.1	577,666	37.5
October	343,962	20.6	686,741	41.1	1,007,417	62.6	792,310	52.0	663,287	43.1
November	366,119	22.7	681,820	42.3	882,643	59.2	587,241	39.7	679,653	45.6
December	418,630	27.0	661,515	42.7	1,067,365	68.8	489,070	32.1	.....	...
Minus yearly adjustment	(—19,907)	...	(—23,750)	...	(—40,859)	...	(—77,113)	...	.....	...
Total for year....	5,905,966	30.6	7,347,549	38.1	10,784,273	58.2	12,748,354	70.4	.....	...

*Annual capacity 18,114,000 gross tons, with monthly percentages based on actual number of weeks in each month.

THIS WEEK ON THE ASSEMBLY LINE

By W. F. SHERMAN
Detroit Editor

. . . Industry to maintain 100,000-rate despite union-shortened work week . . . Ford reports sales increases during December . . . Adjustment-proof engines predicted as next design step.

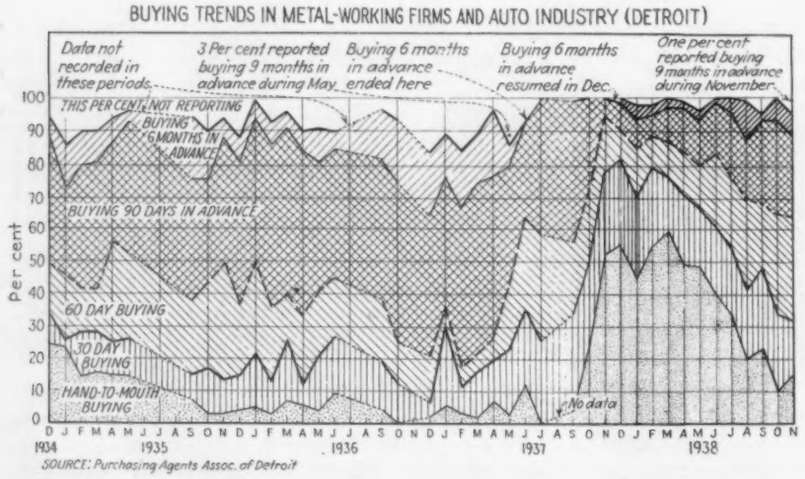
DETROIT.—Despite a forced reduction to a 32-hr. work-week at Chevrolet's Flint plant, automobile output last week reached a new 1938 high of 102,905 units, compared with 100,705 in the previous week and 82,025 a year ago, according to Ward's Automotive Reports.

When the UAW local union in Flint voted early last week to force Chevrolet and Buick plants in Flint to shorten the work week from 40 to 32 hr., union leaders intended to force the management to rehire an additional 6000 men, said by the union to be in danger of losing their seniority status because they have been out of work a year. In a surprise announcement a day or two later, General Motors Corp. announced that the Chevrolet division would be placed on a four-day, 32-hr. basis immediately and that Buick would follow the same plan in the week beginning Dec. 18. The corporation did not elaborate on its statement and gave no indication that it planned to hire more men to maintain production at present levels.

Total car output will not be cut as seriously as indicated, however, in the case of Chevrolet. The major output of the Flint plant is engines, of which there is a sizable bank. Most of Chevrolet's assembly work is done in branch plants. Real effects will not be felt until a motor shortage develops to affect the branch plants, but that danger is weeks away. Christmas and New Year's holidays would have reduced the weeks of Dec. 25 and Jan. 1 to four working days anyhow. Obviously Chevrolet production will not be penalized seriously until some time after the week of Jan. 8. Buick production will be affected immediately, the loss being 1000 to 2000 for the current week and again starting Jan. 8.

Output of Ford and Mercury cars increased slightly during the past week from 20,500 to 20,750. Lincoln-Zephyr output added to this brought the company's total to 21,450. Chevrolet figures decreased 500 to 25,500. Plymouth registered a gain of 100, to 13,900. With one exception, the independent producers showed increases during the past week.

BUYING TRENDS IN METAL-WORKING FIRMS AND AUTO INDUSTRY (DETROIT)


Data not recorded in these periods
3 Per cent reported buying 9 months in advance during May
Buying 6 months in advance ended here
Buying 6 months in advance resumed in Dec.
One per cent reported buying 9 months in advance during November
THIS PER CENT NOT REPORTING BUYING 6 MONTHS IN ADVANCE
BUYING 90 DAYS IN ADVANCE
60 DAY BUYING
30 DAY BUYING
HAND-TO-MOUTH BUYING
No data
Per cent
100
90
80
70
60
50
40
30
20
10
0
D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N
1934
1935
1936
1937
1938
SOURCE: Purchasing Agents Assoc. of Detroit

Retail Sales Gain

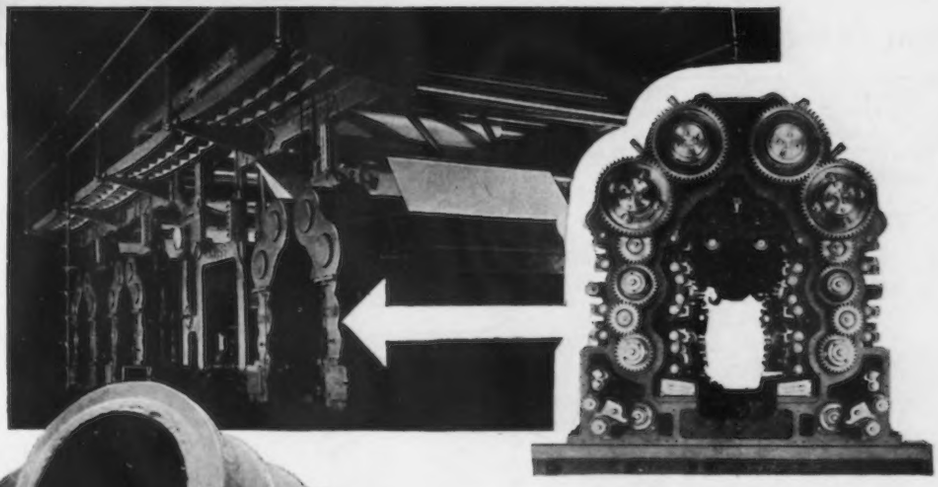
The first 10 days of December brought further sharp advances in retail sales. Ford Motor Co., for instance, reported that sales during this period exceeded by more than 3000 those of any first 10-day period in 1938. Indications such as this bear out the opinion expressed a week ago in the Assembly Line that lag in production during the winter weeks will be of less than normal seasonal proportions.

With the 32-hr. week forced into effect at Flint, several hundred workers of the Highland Park plant of the Chrysler Corp. engaged in a "stay-away protest" last Friday, resulting in the corporation's sending home an additional 500 men because of a shortage of materials. Cause of the "stay at home" was simply a determination to reduce the work week from 40 hr. to 32 hr. The local union president is credited with the definition: "This is not a strike, it is a stay-away protest."

Time flies! The first sitdown (and quotation marks were used around the word then) took place in Michigan just two years ago, beginning in a plant of the Aluminum Corp. of America on Dec. 10, 1936. Others followed, with a sitdown starting in plants of the Kelsey-Hayes Wheel Co. a day later, on Dec. 11. And that year of

NICKEL *turns the oldest metals to* NEW and WIDER USES

Among the metals whose commercial use dates back for centuries is cast iron . . . a material that has always been highly respected for its adaptability, machinability and low cost. Times have changed . . . so has cast iron — thanks to scientific foundry practice and the intelligent use of alloying elements — principally Nickel. Considerably stronger, harder and more wear-resistant than the unalloyed product, Nickel Cast Iron is economical for many modern applications. For example, the Nickel cast iron fender forming die pictured here is capable of stamping out more than 30,000 automobile fenders without redressing. This performance is 3 to 6 times greater than is possible with plain grey iron and results in fewer interruptions of the production schedule for regrinding operations as well as appreciable reductions in maintenance costs.



Here is a modern newspaper press manufactured by Goss of Chicago in which all the gears are made of Nickel Cast Iron. In selecting this material for this application, Goss engineers were able to take advantage of the initial economy of cast iron. In addition, they obtained gears capable of withstanding the stress and wear of high speed operation — thanks to Nickel.

NICKEL CAST IRONS

Modern railroads cannot tolerate excessive locomotive failures. For instance, in cylinders, due to the trend towards greater tractive effort at high speeds, higher boiler pressures and superheated steam with its increased cylinder temperatures, strength, density and pressure tightness are the prime requisites. That is why railroads are turning more and more to Nickel Cast Iron for this purpose and various other applications demanding these all-important properties.

Our casting specialists will be glad to consult with you and suggest where the Nickel Cast Irons will effect economies in your plant or equipment.

THE INTERNATIONAL NICKEL COMPANY, INC., NEW YORK, N. Y.

grace was ended with the calling of two more sitdowns, one on Dec. 28 in a plant of the Bohn Aluminum & Brass Corp. and another on Dec. 29 in the Walker Michigan Co. at Jackson. And today we have "stay-away protests!"

Predicts More Perfect Engine

Automobile engines that would require no attention, not even adjustments, for upward of 25,000 miles were predicted at a recent meeting of the Society of Automotive Engineers by Alex Taub, formerly engine design chief for Chevrolet for 12 years. Returned to this country for a visit after leading a research program at Vauxhall, Ltd., the General Motors plant in England, Taub went on record as predicting fool-proof engines as the next logical step in design. Modern styling has made engines inaccessible for adjustments, and this in itself makes it sharply necessary to improve the engine, he declared. He was particularly critical about engine accessories such as ignition, lubrication, spark plugs and carburetors. Lubricants must be the same the year around, he said. Oil filters must be made good for something better than 8000 miles. Spark plugs, he declared, must be guaranteed for upwards of 25,000 miles or the full life of the car. Tappet adjustments must be eliminated entirely.

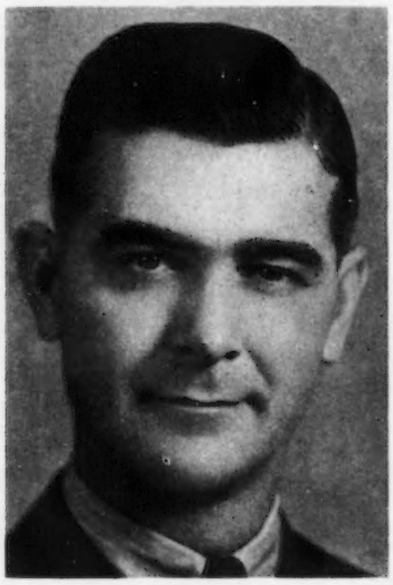
Steps in the right direction have already been made, of course. Ford tappets are of the type which require no adjustments, and numerous cars in the last year have used self-adjusting, hydraulic tappets. On the other points, Taub found a lot of agreement among the 450 engineers who heard him talk.

A few years ago one of the independent companies, now out of existence, had plans for a light four-cylinder engine in which the head and block were a unit, pistons were inserted from below and the oil pan was welded on, defying amateur mechanics to attempt a Saturday afternoon overhaul job. Engines in need of repairs would be traded in for new ones at the factory, under this plan.

Tool Buying Expected

Indications that 1940 model auto plans will call for the purchase of new machinery and production equipment during 1939 in much greater volume than in 1938 have already received comment. This opinion is reinforced by a comment of an official of the American Society of Tool Engineers.

"Most mass production industries, such as the automotive, normally place their orders for machinery and equipment in the spring and early summer months," Ford Lamb, executive secretary, said. "Last year indications were that some $65,000,000 would be spent for new equipment. Some of these programs were subsequently suspended in view of business conditions and may form a part of 1939 buying programs." Included, of course, are several programs for new engine manufacturing lines. Designs which were "ready to go" last spring probably will come up for approval shortly after the first of the year.



R. G. SCHULTE becomes something of a soothsayer and prophet as he assumes his new role as market analysis manager for Chevrolet. Economic forecasts and analyses play an important part in an industry where hundreds of thousands of dollars worth of product must be manufactured far in advance of its retail selling date and raw materials purchased sometimes months ahead. Mr. Schulte succeeds E. P. Feely, who will now head the newly established Territorial Security Department.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

WOULD YOU MIND EXPLAINING THAT TO US WOMEN?
WELL, THAT'S A MAIN HOIST DRUM FOR AN ELECTRIC CRANE, AND THAT'S A CABLE GROOVE I'M CUTTIN' IN IT NOW--ONE GROOVE IS RIGHT-HANDED AND TH' OTHER LEFT, AND--
TH' BOSS LOOKS KINDA SORE BECAUSE SHE DIDN'T ASK HIM--I'D THINK HE'D BE GLAD TO GET OUT OF EXPLAININ' TO PEOPLE WHO DON'T KNOW WHAT YOU'RE TALKIN' ABOUT
I'D BE SORE, TOO--THAT'S HIS WIFE AND HE MUST AMOUNT TO SO LITTLE AROUND TH' HOME THAT SHE CAN'T BELIEVE HE AMOUNTS TO ANYTHING HERE EITHER
COPR. 1938 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.
THE DUNCE CAP
J.R.WILLIAMS 12-16

Bethlehem Obtains Lead-Bearing License

CHICAGO.—Inland Steel Co. has granted a license to the Bethlehem Steel Co. to produce lead-bearing steels under Inland patents.

Current Metal Working Activity

Latest Data Assembled by THE IRON AGE from Recognized Sources

	November 1938	October 1938	September 1938	October 1937	Ten Months 1938	Ten Months 1937
Steel Ingots: (gross tons)						
Monthly output[a]	3,572,220	3,117,934	2,657,748	3,392,924	21,123,827	45,875,521
Average weekly output[a]	832,685	703,823	620,969	765,897	486,389	1,056,309
Per cent of capacity[a]	62.05	52.45	46.28	58.31	36.25	80.42
Pig Iron: (gross tons)						
Monthly output[b]	2,269,983	2,052,284	1,680,435	2,892,629	14,301,525	33,114,269
Raw Materials:						
Coke output[c] (net tons)		3,156,106	2,730,789	4,260,600	25,872,124	46,025,400
Lake Ore consumed[d] (gross tons)		2,780,585	2,313,865	4,203,873	17,485,458	49,344,984
Castings: (net tons)						
Malleable, orders[e]		32,989	29,061	34,810	217,327	502,049
Steel, orders[e]		25,418	25,565	36,837	264,163	818,993
Finished Steel: (net tons)						
Trackwork shipments[a]	2,275	2,410	2,346	6,137	29,814	84,028
Fabricated shape orders[f]		137,642	92,469	62,267	922,996	1,396,726
Fabricated plate orders[e]		21,793	18,551	31,942	236,630	373,914
U. S. Steel Corp. shipments[g]		663,287	577,666	792,310	5,251,511	11,749,156
Fabricated Products:						
Automobile production[h]	372,000	242,000	89,623	337,979	1,858,331	4,292,459
Steel furniture shipments[e]		$1,718‡	$1,667‡	$2,020‡	$16,643‡	$22,824‡
Steel boiler orders[e] (sq. ft.)		717,307	578,940	635,505	6,201,857	8,767,265
Locomotives ordered[i]		29	5	0	130	278
Freight cars ordered[i]		2,435	1,079	21	11,841	47,826
Machine tool index[j]	138.0	118.1	117.4	152.0	118.8†	180.8†
Foundry equipment index[k]	89.7	87.9	78.7	185.2	83.3†	224.6†
Non-Ferrous Metals: (net tons)						
Lead shipments[l]		45,726	39,026	39,292	345,712	508,060
Lead stocks[l]		117,476	131,353	100,646	.....	.....
Zinc shipments[m]	43,693	43,355	43,582	40,345	312,507	507,890
Zinc stocks[m]	120,778	124,128	130,743	25,817	.....	.....
Tin deliveries[n] (gross tons)	3,535	4,960	4,465	8,210	43,725	73,450
Refined copper shipments[o]		82,605	67,919	44,592	494,844	751,393
Refined copper stocks[o]		267,299	293,080	181,842	267,299	259,351
Exports: (gross tons)						
Total iron and steel[p]		425,431	346,068	522,611	4,193,016	6,384,848
All rolled and finished steel[p]		114,583	112,915	217,787	1,149,023	1,714,965
Scrap[p]		221,466	147,203	184,547	2,386,323	3,466,055
Imports: (gross tons)						
Total iron and steel[p]		26,445	27,958	37,186	208,157	480,372
Pig iron[p]		1,174	6,922	11,870	30,358	95,908
All rolled and finished steel[p]		13,548	10,349	14,341	130,208	238,774
British Production: (gross tons)						
Pig iron[q]	461,500	469,400	429,800	769,600	5,855,400	6,949,100
Steel ingots[q]	860,000	854,800	754,700	1,133,600	8,878,100	10,681,900

† Three months' average. ‡ 000 omitted.

Source of data: [a] American Iron and Steel Institute; [b] THE IRON AGE; [c] Bureau of Mines; [d] Lake Superior Iron Ore Association; [e] Bureau of the Census; [f] American Institute of Steel Construction; [g] United States Steel Corp.; [h] Preliminary figures from Ward's Automotive Reports—Final figures from Bureau of the Census, U. S. and Canada; [i] *Railway Age*; [j] National Machine Tool Builders Association; [k] Foundry Equipment Manufacturers Association; [l] American Bureau of Metal Statistics; [m] American Zinc Institute; [n] New York Commodity Exchange; [o] Copper Institute; [p] Department of Commerce; [q] British Iron and Steel Federation.

THIS WEEK IN WASHINGTON

. . . Vandenberg predicts incentive taxation in some form will be part of next Federal tax law . . . Industry fears Hopkins will take Roper's place as secretary of commerce . . . Manganese association leader "surprised" at Roosevelt defense statement.

o o o

By L. W. MOFFETT
Resident Washington Editor
The Iron Age

o o o

WASHINGTON.—The Senate committee exploring the possibility of industrial profit sharing with employees in return for tax concessions by the Government concluded its hearings last week and encountered during the last three days of testimony an increasing number of witnesses who characterized incentive taxation as unsound and a step leading to punitive taxation of industry. At the same time Senator Vandenberg, committee chairman, called incentive taxation one of the "most encouraging instrumentalities" to stimulate productivity and profits and forecast that the idea in some form will find its way into the next Federal tax law.

Lothair Teetor, president of the Perfect Circle Co., Hagerstown, Ind., told the committee that the undistributed profits tax was "our first great experiment in incentive taxation" and turned out to be "a dismal failure."

Industrial profit-sharing, said C. P. Cooper, vice-president of the American Telephone & Telegraph Co., "would tend to exaggerate the peaks and valleys of industrial booms and depressions," although he conceded that some systems had worked out very well. But for industry as a whole to adopt a profit-sharing policy would not be helpful, Mr. Cooper said.

Incentive Taxation Practical

J. A. Gibson, vice-president of the Simplex Wire & Cable Co., Cambridge, Mass., concurred with Mr. Teetor and others that the theory of allowing tax concessions in return for the establishment of profit-sharing by employers was wrong in principle. They agreed, however, with C. S. Redding, vice-president of Leeds & Northrup, and Frederick E. Macy, of the A. M. Collins Mfg. Co., Philadelphia, that profit-sharing aimed in the direction of improving labor relations was good policy. Both Mr. Redding and Mr. Macy expressed the view that incentive taxation was practical.

Mr. Teetor told the committee, composed of Senators Vandenberg, Republican of Michigan, and Herring, Democrat of Iowa, that a CIO sit-down strike and new wage demands at the company's New Castle, Ind., plant had forced his organization to abandon a profit-sharing plan under which employees received an amount equal to 75 per cent of any extra dividends given to stockholders above the regular $2-a-share payments.

He attributed the failure of the plan in his plants to "hatred" caused by industrial conflict and the failure of workers to recognize the fairness of the profit-sharing system to both themselves and their employer.

Would Produce Turmoil

"A profit-sharing plan has no place on the statute books in this country," Mr. Teetor asserted. "To treat the problem as a legislative matter would be to bring fresh turmoil to business."

A more liberal tax allowance for depreciation of railroad equipment and property was suggested by G. P. McNear, Jr., president of the Toledo, Peoria & Western Railroad, as a possibility for stimulating railroad replacement purchases. The company, which has never borrowed money from the Government but which has opposed Government interference according to Mr. McNear's testimony, has been forced since its purchase in 1926 to operate at a profit because of its inability to sell any large volume of securities. All employees were paid a bonus of a week's salary in 1936 and 1937, and in 1936 received an average annual wage of $1,682, about the average for Class 1 carriers, Mr. McNear told the committee.

Asked by Chairman Vandenberg why the railroad could be run in the black when almost every other road in the country is in the red, the witness replied that "we insist on running our own business." He protested that railroads pay higher social security taxes than other industries and asked that the Government not bring undue pressure on so-called family holding companies which he described as doing a highly constructive job.

Key to Cooperation

At the conclusion of the hearings, Senator Vandenberg expressed the view that the incentive tax idea is here to stay and that it is "the key to Government cooperation in business." The novelty of the idea, he asserted, properly calls for prudence and caution but the necessity for it calls for early experiments. He forecast that his committee will ultimately present specific proposals to Congress. Presumably, these could take the form of an amendment to the next tax bill or be incorporated in a separate bill.

It is believed, however, that such legislation stands little chance of suc-

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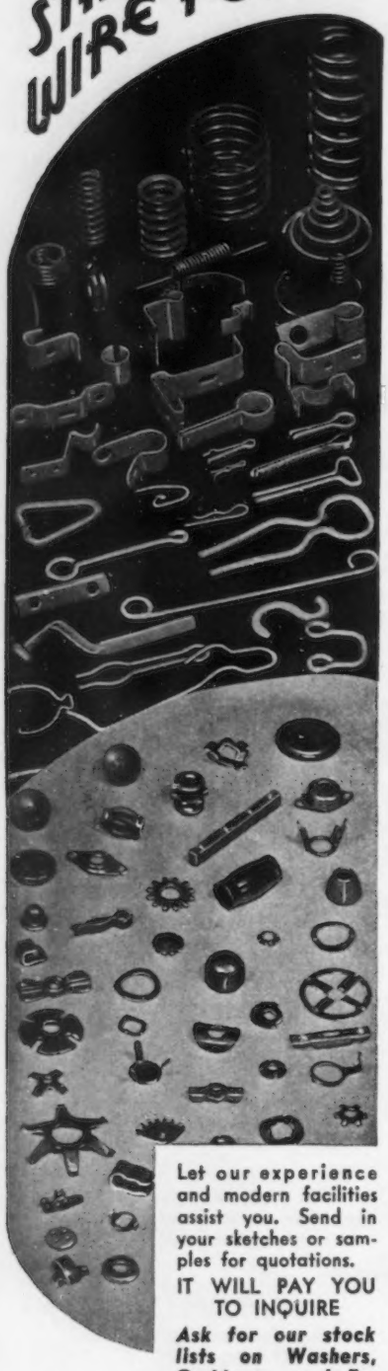

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cess. Testimony developed at the hearings showed that business groups are divided on the matter, and that organized labor opposes the plan. Vandenberg, being a Republican, conceivably would have difficulty mustering sufficient support for the measure to assure passage.

The Treasury Department is giving the matter further study along with its general consideration of tax legislation but fears have been expressed that the Administration may be thinking of the proposal in terms of a spring board through which it could introduce punitive taxes as a method for exercising further control over business.

1939 Steel Purchases By PWA May More Than Double 1938

WASHINGTON. — The 1939 purchases of iron and steel and their products for PWA projects will, according to estimates prepared by that Government agency for THE IRON AGE, exceed by more than 230 per cent the amount of these materials purchased for PWA projects in 1938. The estimate for 1939 indicates orders totaling $250,000,000 as against $75,000,000 for 1938. The purchases for 1939 will set a new record for iron and steel consumption on PWA projects, nearly doubling the previous high of $141,000,000 which occurred for the year 1936. The year 1938, on the other hand, produced the lowest yearly total since the inception of this Administration in 1933.

The pronounced increase in potential orders for 1939 is made possible by the $965,000,000 appropriation by Congress, under the Public Works Administration Appropriation Act of 1938. The new program, financed partly with Federal funds and partly with State and local funds will provide a construction program having a total estimated cost of more than $1,600,000,000. The provisions contained in the new Act which restrict the program to projects that can be placed under construction by Jan. 1, 1939, and substantially completed by June 30, 1940, indicate that the bulk of materials required will be purchased in 1939. However, the estimate of iron and steel for the entire year includes the requirements necessary for the completion of projects which received allotments under prior Public Works Administration programs.

Approved Last June

Although the new program was approved in the latter part of June 1938, and a large number of projects placed under construction shortly thereafter, the increased volume of steel orders for the last half of the year is not expected to offset the effect of the curtailment of PWA expenditures in the first half of the year. The revival of business and industrial activity in 1936 and through July 1937, to the highest level since 1929, resulted in the discontinuance of appropriations for any additional PWA projects. As a consequence, the Administration, in 1937 and the first half of 1938, operated on a greatly curtailed program and was actually in the process of a gradual liquidation.

"The recession in business which began in August 1937, however, directed attention to the need for a further public works program, and as a consequence thereof, Congress enacted the Public Works Administration Appropriation Act of 1938," said the PWA statement.

The estimates for 1939 are based on the value of material orders placed for similar projects built under prior PWA programs, as reported by the Bureau of Labor Statistics, Department of Labor. Construction materials classified as iron and steel and their products include, principally, structural and reinforcing steel, and other rolling mill products, steel and cast iron pipes and fittings, heating and ventilating equipment, and hardware.

Third Spent for Steel

"Steel and iron are, in a sense, symbolic of permanence," it was pointed out. "It is significant, therefore, that of every three dollars spent for construction materials on PWA projects, approximately one dollar has been spent for products of the iron and steel industry. Schools, municipal buildings, bridges, grade-crossings, subways, power plants, and water and sewer systems, all utilize substantial amounts of iron and steel products."

Some of the outstanding PWA projects which have been completed

in 1938, and some that will be completed in 1939, are:

Little Rock, Ark., waterworks system: Orders for iron and steel products used in this project amounted to nearly $1,250,000. Expenditure of more than $1,100,000 for cast iron pipe and fittings represented the major cost of materials. Construction was completed in February, 1938.

Extension of San Francisco water supply system: This project required purchases of iron and steel products totaling more than $2,500,000. Approximately 80 per cent of this amount or $2,200,000 was spent for the long steel and cast iron pipe lines. Reinforcing steel orders amounting to nearly $250,000 constituted the only other important iron and steel products. Construction completed June 21, 1938.

School building, Brooklyn: Total cost, $1,048,000. To be of steel frame construction with reinforced concrete foundation. Construction will be completed in November, 1939.

Bridge across Elk River in Charlestown, W. Va.: This project, completed Nov. 26, 1938, required $200,000 worth of iron and steel, of which nearly $150,000 was for structural material.

Engine, Turbine Output Climbs Sharply in 1937

WASHINGTON. — Rising 94.7 per cent the value of engines, turbines, water wheels and windmills produced in 1937 was $194,695,037 compared with $99,996,336 in 1935, according to the Bureau of the Census. Wage earners employed in 1937 numbered 32,860, an increase of 48.9 per cent over 22,062 reported for 1935, and wages paid, $50,843,521, represented an increase of 89.4 per cent over $26,844,519, the figure reported for 1935. Steam engines and turbines produced last year were valued at $19,087,441, compared with $11,180,102 in 1935. The 1937 output of internal combustion engines in 1937 was valued at $131,246,901 compared with $65,428,719 in 1935. The report embraces establishments engaged primarily in the manufacture of engines not for installation in the plants of production.

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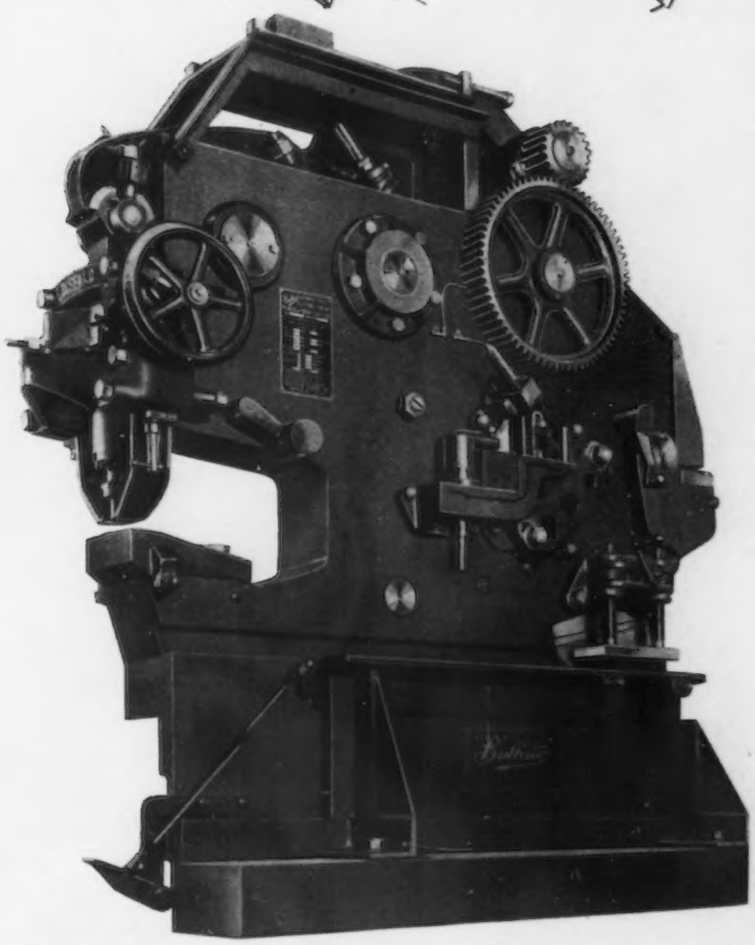

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Possibility Hopkins May Get Roper's Post Stirs Business

WASHINGTON.— Resignation of Daniel C. Roper as Secretary of Commerce, effective Dec. 23, came as no surprise but entirely unconfirmed reports that WPA Administrator Harry L. Hopkins would be named to the Cabinet post have created a furore. Meanwhile the President, when asked last Friday about successors to both Mr. Roper and Homer S. Cummings, who also has announced he is giving up his office as Attorney General, said there would be no announcement for the present. As for Mr. Hopkins, he sought to belittle the report that he would be made head of the Department of Commerce.

Nevertheless, business interests, far from taking the reports lightly, have reflected deep concern over them. George H. Davis, president of the Chamber of Commerce of the United States, issued a statement which inferentially opposed Hopkins' appointment. The statement said that the vacancy afforded by Mr. Roper's resignation afforded the President an opportunity to appoint a man who would help to restore confidence to business. Mr. Davis said that "the occupant of this Cabinet position should be a man recognized as a competent spokesman . . . for business interests."

World's Biggest Spender

Mr. Hopkins' training has been entirely in the social field and as head of the WPA he has been bitterly criticized as the world's most lavish spender of taxpayers' money, manifesting a disregard of sound use of the huge funds at his disposal that runs completely counter to a practice that business must recognize if it is to remain solvent. Mr. Hopkins also has frequently been a vigorous critic of business. Should he be named by the President to head the Commerce Department, his confirmation would be bitterly opposed in the Senate, particularly because of his tactics of plunging with the Administration into politics during the recent unsuccessful purge campaign during which it was charged that WPA funds were misused to influence votes.

Already a group of Democratic senators have announced they will strongly oppose confirmation if Mr. Hopkins is named to the Commerce post. Rarely, however, is a Presidential appointment of a Cabinet member denied confirmation. Those who doubt that Mr. Hopkins will be named to succeed Mr. Roper are of the opinion that the President hopes to put through his government reorganization bill, under which a Department of Public Welfare would be established, and name Mr. Hopkins as head of the new department.

Opposed "Palace Junta"

Mr. Roper's resignation long has been rumored. It is well known that he was at odds with what has been called the "palace junta" of the leftist New Deal, often identified as White House favorites. His Department has been described as an unwanted stepchild of the Administration. It has been deprived of so much of its high prestige as built up by Mr. Hoover, that it has developed into little more than a statistical gathering and steamship inspection organization. His "long expressed desire" to return to "private life in order to give needed attention to my personal affairs" was given by Mr. Roper as the reason for his resignation.

Government Steel Purchases Mount

WASHINGTON. — Iron and steel contracts made under the Walsh-Healey Act during the week ended Dec. 10 totaled $827,508; machinery contracts, $1,911,687 and transportation equipment contracts, $23,224,290. Details follow:

IRON, STEEL & THEIR PRODUCTS:

Republic Steel Corp., bolts and nuts	$26,992.43
The Tredegar Co., Richmond, Va., projectiles	16,804.50
The Midvale Co., Philadelphia, gun barrel forgings	161,794.65
The Heppenstall Co., Pittsburgh, breech housing forg.	61,530.75
The Midvale Co., Philadelphia, forgings	37,788.00
Lynchburg Foundry Co., Chicago, cast iron pipe	11,409.20
Alabama Pipe Co., Chicago, cast iron pipe	17,162.75
Bethlehem Steel Co., Bethlehem, Pa., rails	*14,613.94
Carnegie-Illinois Steel Corp., Washington, D. C., bar and strip	*18,300.00
The Colorado Fuel & Iron Corp., Denver, tie plates	15,990.00
Central Iron & Steel Co., Harrisburg, Pa., plates, sheets	*310,000.00
Philadelphia Gear Works, Philadelphia, steel plates	17,550.00
Central Iron & Steel Co., Harrisburg, Pa., steel plates	*42,350.00
Carnegie-Illinois Steel Corp., Washington, D. C., structural steel	*46,000.00
Bethlehem Fabricators, Inc., New York, structural steel	17,022.10
Somaron Sheet Metal Works, Inc., Bronx, N. Y., stainless steel	12,200.00

NONFERROUS METALS AND ALLOYS:

Pollak Mfg. Co., Arlington, N. J., cartridge tanks	$192,500.00
The American Brass Co., Waterbury, Conn., cartridge brass cups	25,176.00

OTHER MACHINERY:

Enterprise Engine Co., San Francisco, marine engine	$19,880.00
General Motors Corp., Cleveland Diesel Engine Division, Cleveland, propelling mach.	1,655,410.00
Arch Dalrymple, Jr., Amory, Miss., tractors	14,970.00
The American Tool Works Co., Cincinnati, drill	10,387.00
The Monarch Machine Tool Co., Sidney, Ohio, lathes	10,518.00
The Bullard Co., Bridgeport, Conn., chucking machinery	36,881.60
Brown & Sharpe Mfg. Co., Providence, R. I., milling mach.	12,018.78
Brown & Sharpe Mfg. Co., Providence, R. I., grinding mach.	22,799.00
Milwaukee Electric Tool Corp., Milwaukee, grinders and drills	11,427.50
Allis-Chalmers Mfg. Co., Milwaukee, tractor and trail-builder outfits	92,898.60
The Philadelphia Drying Machinery Co., Philadelphia, dry cleaning machine	11,391.00
New Home Sewing Machine Co., Rockford, Ill., sewing machines	13,106.25

ELECTRICAL APPARATUS & SUPPLIES:

Westinghouse Elec. & Mfg. Co., Washington, D. C., switches	$182,736.00
Westinghouse Elec. & Mfg. Co., Chattanooga, Tenn., oil circuit breakers	19,940.00
NePage McKenny Co., Seattle, Wash., distribution panels	108,981.66

TRANSPORTATION EQUIPMENT:

New York Shipbuilding Corp., Camden, N. J., destroyer tender	$11,947,000.00
New York Shipbuilding Corp., Camden, N. J., seaplane tender	11,249,000.00
The Timken-Detroit Axle Co., Detroit, machine finished axles	11,905.60
The Timken-Detroit Axle Co., Detroit, axle and brake parts	16,385.30

*Estimated.

Steel Tubing Factory Planned for Australia

WASHINGTON. — Plans have been completed by British interests to form a company to pioneer the manufacture in Australia of precision steel tubing, according to a report received by the Department of Commerce from the office of the American Trade Commissioner at Sydney. It is proposed next year to erect a factory in Victoria, which, at the outset, will give employment to 300 men. Most of the precision steel tube requirements of Australia have been imported from England. The new plant will manufacture all types of precision tubing from stainless steel ranging from tubes for hypodermic needles to tubes for bicycle frames.

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. . . PERSONALS . . .

IRA GRIBBEN, after 40 years' continuous service, will retire Jan. 1 as assistant to the manager of the Pittsburgh district of American Steel & Wire Co. Mr. Gribben started working for the wire company in June, 1898, as sales ledger clerk in the Pittsburgh office. He was progressively moved up through various positions until he was placed in charge of the safety, casualty and pensions division of the industrial relations department in October, 1925. In November, 1937, all industrial relations activities of the Pittsburgh district were brought under one office with Mr. Gribben in charge and on June 1, 1938, he was appointed to the position from which he is now retiring.

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JOHN B. AUSTIN, metallurgist and welding consultant, has joined the staff of Republic Welding & Flame Cutting Co., Cleveland. During the past 17 years he has been widely known throughout the steel and metal working industries in connection with welding developments and processes. The Republic company fabricates machine bases, frames and parts from rolled steel, cut and welded.

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G. B. SCHUYLER has been appointed executive vice-president of Apex Electrical Mfg. Co., Cleveland. The post is newly created. Mr. Schuyler previously has been in charge of Western operations, with headquarters at Oakland, Cal. S. W. TAYLOR has been appointed vice-president in charge of plant operations. He was formerly with Nash-Kelvinator Corp., Detroit. Previously he had been associated with Copeland Refrigerator Co., Lincoln Motor Car Co. and Chrysler Corp.

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L. E. CREIGHTON, formerly vice-president and general manager of the Union Drawn Steel Co., division of Republic Steel Corp., has been appointed manager of bar products for Republic, including both hot and cold drawn sales, a newly created post. Mr. Creighton, who has been with Union Drawn at Massillon for many years, will make his headquarters in Cleveland. Sales of hot rolled products will continue to be handled by W. F. VOSMER, manager of sales, bar division, and sales of cold drawn steel by F. C. YOUNG, manager of sales, Union Drawn Steel division at Massillon.

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R. H. MCGREDY, for many years a sales executive of the Harnischfeger Corp., Milwaukee, has been appointed manager of the Harnischfeger Washington office.

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CLINTON H. CRANE, president of St. Joseph Lead Co., was recently tendered a dinner by his business associates in commemoration of the 25th anniversary of his election to the presidency of the company. During the World War Mr. Crane was head of the Lead Industries Board and at present is president of the Lead Industries Association.

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FRANK E. WALLING has been appointed superintendent of rolling, Carnegie-Illinois Steel Corp.'s Duquesne, Pa., works, succeeding W. H. BOYLE, resigned.

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R. I. PETRIE has been elected president and general manager of the Barlow & Selig Mfg. Co., Ripon, Wis., manufacturer of washing machines

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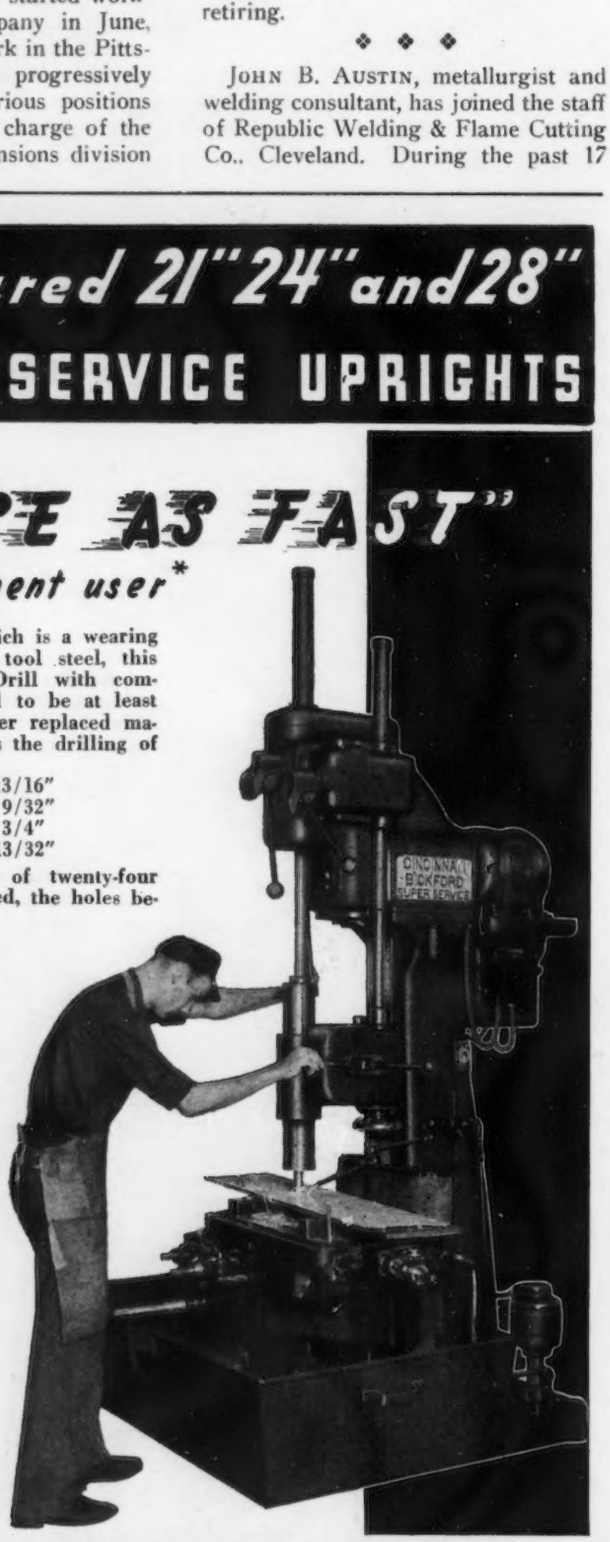

SUPER SERVICE C B

THE CINCINNATI BICKFORD TOOL CO.
OAKLEY CINCINNATI OHIO U.S.A.

and other domestic laundry appliances. He succeeds R. C. STUART, who has been elected chairman of the board. Mr. Petrie was formerly an executive of the Kelvinator Corp., Detroit, now the Nash-Kelvinator Corp.

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L. B. OLSON and ROBERT KING, welding supervisors of the Manitowoc Ship Building Corp., Manitowoc, Wis., addressed the December meeting of the Milwaukee section, American Welding Society, on "Cutting and Welding in Ship Construction."

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ROBERT A. WALLACE, industrial engineer, Carnegie-Illinois Steel Corp., Chicago, will join the faculty of the Carnegie Institute of Technology, Pittsburgh, effective Feb. 1, 1939, as associate professor of management engineering.

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ALBERT SINGER, H. J. MERVIS, N. B. HUMPHRIES and WILLIAM B. CUDLIP have been added to the board of directors of Consumers Steel Products Corp., Detroit. At a subsequent meeting of the full board, Mr. Singer was elected vice-president and treasurer and Mr. Cudlip was elected secretary. LEWIS J. EPPS was reelected president. Mr. Singer is president of Singer Steel Co., Cleveland, and Mr. Mervis is associated with him in that company.

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C. M. YOUNG, president of the L. A. Young Spring & Wire Co., has been elected president of the Milwaukee Junction Manufacturers Association. Other officers elected were: J. E. McBRIDE, vice-president of the Palmer Bee Co., first vice-president; F. H. WINCKLER, superintendent of Joseph T. Ryerson & Son, Inc., second vice-president; J. W. COLLINS, plant manager of the Aluminum Co. of America, treasurer; GEORGE A. SADLER, manager of the association, secretary. The organization was founded in 1902 and is one of the oldest of its kind in the Middle West. It was instrumental in building up the Milwaukee-Junction industrial area of Detroit.

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CHARLES C. MILLER, of the Continental Industrial Engineers Inc., Chicago, is manager of the company's new Detroit branch office.

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WILLIAM P. KNECHT, until recently New England regional manager of the Crucible Steel of America, with headquarters at Cambridge, Mass., has been made European manager for the concern. He will make his headquarters in England.

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R. J. AITCHISON, president of Vascoloy-Ramet Corp. and Fansteel Metallurgical Corp., North Chicago, Ill., has been elected a director of the Illinois Manufacturers Association.

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DR. DANIEL S. EPPELSHEIMER, formerly with the Union Carbide & Carbon Research Laboratory, Niagara Falls, N. Y., has been appointed research associate professor of industrial engineering at the University of New Hampshire to head up the industrial research of the Engineering Experiment Station of the College of Technology.

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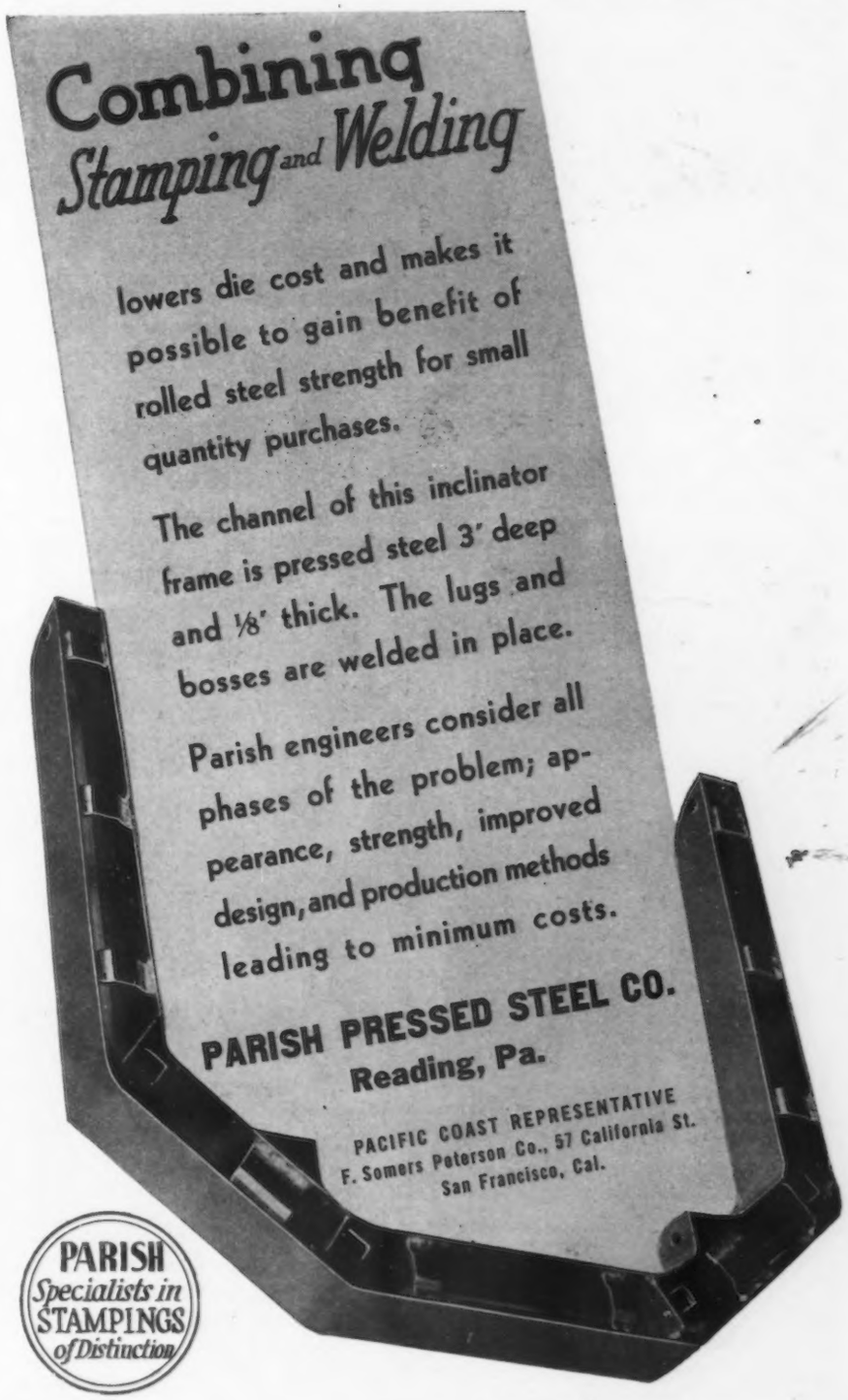
E. P. ORDWAY, heretofore vice-president and chief engineer of the Union Steam Pump Co., Battle Creek, Mich., has been elected president. He has been identified with the company for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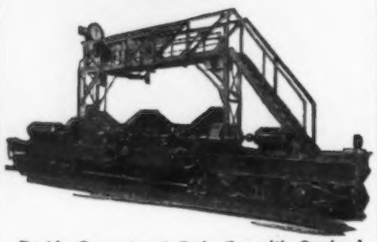

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31 years and received his engineering education at the United States Naval Academy at Annapolis, Md.

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MARSHALL POST, president of the American Foundrymen's Association and vice-president and general manager of the Birdsboro Steel Foundry & Machine Co., has returned from a tour of Mid-West cities where he addressed members of the association in Detroit, Milwaukee and the Quad City chapter at Moline, Ill. His talks covered recent developments in the field of cast metals.

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DR. GEORGE SACHS, formerly head of the mechanical and X-ray departments at the Kaiser Wilhelm Institute, Berlin, has joined the faculty of Case School of Applied Science, Cleveland. He has recently been head of the precious metals department of the Baker Chemical Co.

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ROSS L. LEFFLER, director, industrial relations, Carnegie-Illinois Steel Corp., Pittsburgh, was recently reappointed vice-president of the Pennsylvania State Game Commission.

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SAMUEL C. CARRIER, who has been head of his own firm for distributing welded boilers and air conditioning equipment since 1931, has joined the sales staff of the Pittsburgh Piping & Equipment Co., Pittsburgh.

❖ ❖ ❖

JOHN F. MALLOY, of Malloy & Shreiner, Philadelphia, has been elected president of the Philadelphia chapter of the Institute of Scrap Iron and Steel. THOMAS BANTIVOGLIO, of Camden Iron & Metal Co., has been elected vice-president, HARRY STAVE, of Stave Brothers, treasurer, and MARCUS J. MARGULIES, of A. M. Wood & Co., secretary.

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E. J. HERGENROETHER, of the Detroit office of the development and research division, International Nickel Co., was to discuss nickel alloy developments in steel and miscellaneous alloys before the Indianapolis chapter of the American Society for Metals on Dec. 19.

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M. N. SMITH has been appointed general manager of the order division of the general sales department, Carnegie-Illinois Steel Corp., Pittsburgh. He formerly was manager, order division, Pittsburgh district.

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J. R. WALKER, formerly assistant manager, order division, Pittsburgh district, has been appointed manager of the Pittsburgh order division; J. M. MOREHOUSE, formerly assistant manager, order division, Chicago district, has been appointed manager, order division of the general sales department with headquarters in Pittsburgh; and H. VAN ZANDT continues as manager, Chicago order division.

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DR. WEBSTER N. JONES, director of the college of engineering at Carnegie Institute of Technology, has been elected president of the American Institute of Chemical Engineers.

. . . OBITUARY . . .

FRANK G. HOGLAND, founder and president, National Lock Co., Rockford, Ill., died last week after a short but serious illness, aged 74 years. From a small shop employing eight men in 1903, the company, under Mr. Hogland's direction, has become one of Rockford's most successful enterprises, employing as many as 3150 persons. He was active in civic and church affairs. But a small portion of the company's output consists of locks at present, automobile hardware and small metal parts for many products accounting for most of the production.

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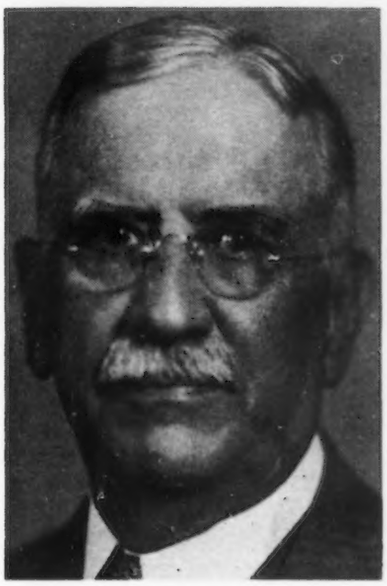
FREDERICK A. INGALLS, vice-president and director, Wyman-Gordon Co., Worcester, Mass., a former Chicagoan, and philanthropist, died last week in Pebble Beach, Cal., aged 82 years. Mr. Ingalls spent most of his life in the steel business. He was a co-founder of the Ingalls-Shephard Forging Co., Harvey, Ill., in 1910, and served as its president until 1919, when the company merged with Wyman-Gordon. Mr. Ingalls, a native of Waukegan, Ill., donated the Ingalls Memorial Hospital to the city of Harvey in 1922 and since has maintained the children's clinic there. In addition, he has donated to Northwestern and Chicago universities. A life member of the Union League Club, Mr. Ingalls also was an original director and trustee of the Union League Foundation for Boys Club, a member of the Chicago Club, Chicago Athletic Association, the Illinois bar and the Midlothian and Flossmoor country clubs.

❖ ❖ ❖

G. PENNELL LEDDICK, 52 years old, a junior partner of the Harvey Foundry Pattern & Machine Co., was buried Dec. 12 at Detroit. Mr. Leddick, who was born in Ovid, Mich., went to Detroit in 1903. He became associated with the A. Harvey & Sons Mfg. Co. and in 1932 became partner in the foundry company.

JOHN B. BRANDEL, 79 years old, former mayor of Owosso, Mich., and retired manufacturer, died Dec. 14. Mr. Brandel founded the Owosso Boiler & Welding Works. One of his sons, J. Lou Brandel, succeeded him in business. Two other sons are with the Olds Motor Works at Lansing, Mich. One of them, Albert Brandel, is general superintendent and the other, Carl Brandel, is auto parts superintendent.



HORACE B. SPACKMAN, formerly vice-president of Lukens Steel Co., whose death was announced in these columns last week.

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JOHN E. STETSON, treasurer and general manager, Bryant Chucking Grinder Co., Springfield, Vt., died on Dec. 6 after a brief illness. He had been with the company for 29 years, first as secretary, afterwards as treasurer and then treasurer and general manager.

❖ ❖ ❖

EDWARD A. JOHNSON, vice-president of the Equitable Meter Co., Pittsburgh, died recently in that city. He was a former sales manager of the Duff-Norton Mfg. Co. and became identified with the Equitable company in 1929.

❖ ❖ ❖

FRED FRAZER, president of the Frazer & Jones Co., Solvay, N. Y., died at his home on Dec. 13, aged 83 years. He had been president of the company since 1875.

❖ ❖ ❖

GEORGE STEELE, former secretary-treasurer of the North Electric Mfg. Co., Galion, Ohio, died Dec. 13 in San Pedro, Calif., aged 86 years.

Preparing for future spring business while we plan today's orders—Dunbar's policy of uninterrupted service to you. *Dunbar career men train understudies in the established traditions of 92 years of quality spring manufacture.*

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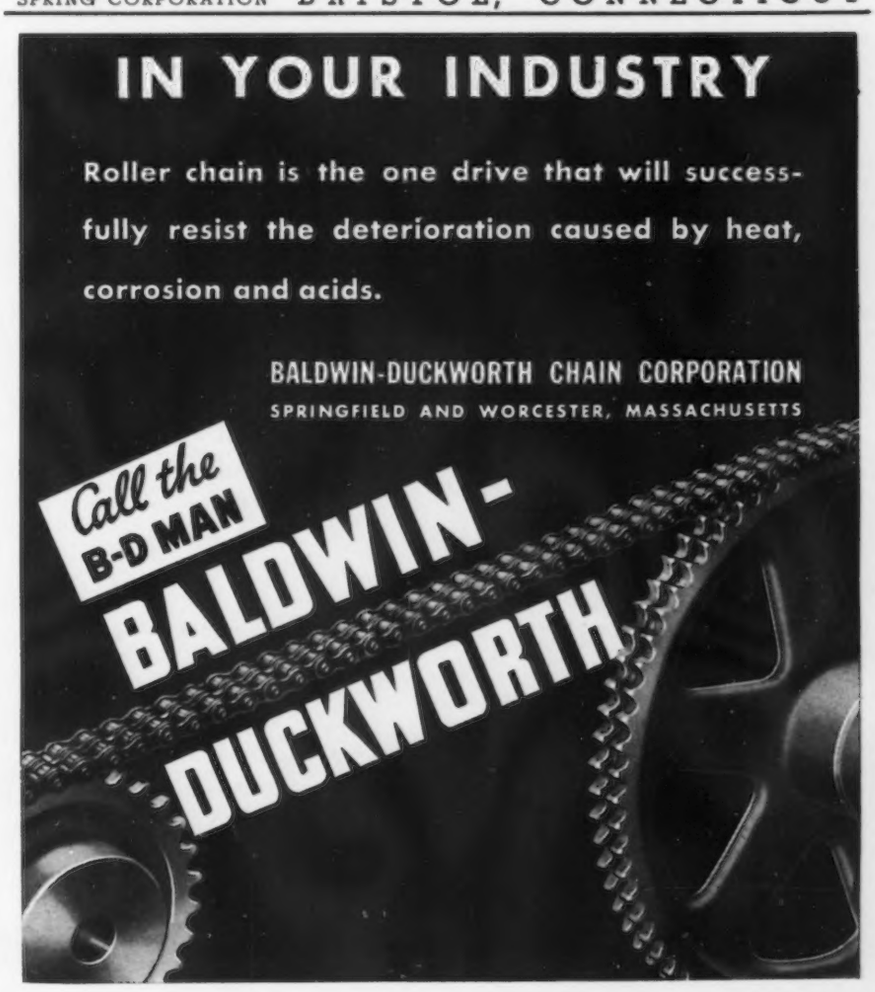
DIVISION OF ASSOCIATED SPRING CORPORATION BRISTOL, CONNECTICUT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. . . THE NEWS IN BRIEF . . .

Republic Steel Corp. announces improvements in its Youngstown district plants.—**Page 31.**

Spencer Lens Co. to double its facilities for precision manufacturing of light mechanical parts.—**Page 39E.**

Consistent good management is the only sure answer to labor relation problems, William Conover, of U. S. Steel Corp., says.—**Page 39E.**

Two thousand industrialists and newsmen visit the new Irvin works as guests of Carnegie-Illinois Steel Corp.—**Page 39F.**

Monthly shipments of finished steel products by United States Steel Corp.—**Page 39H.**

Work-sharing policy of steel producers is shown to have kept 155,000 employees who otherwise might have been dropped from payrolls.—**Page 39H.**

Motor industry to maintain weekly rate of about 100,000 cars despite shorter work week . . . Ford reports increased sales in December. —**Page 40.**

Bethlehem Steel Co. obtains license from Inland Steel Co. to produce lead-bearing steels.—**Page 42.**

Vandenberg predicts incentive taxation in some form will be part of next tax law.—**Page 44.**

Purchases by PWA in 1939 are expected to be 230 per cent more than in 1938, according to PWA report prepared for THE IRON AGE.—**Page 46.**

Government purchases of iron and steel products for latest reported week advance to total of $827,508. —**Page 48.**

Engine, turbine output produced in 1937 totals $194,695,037, almost double 1935 total.—**Page 47.**

Steel tubing factory planned for Australia.—**Page 48.**

Business is concerned over possibilities that Harry L. Hopkins will take Roper's post as Secretary of Commerce.—**Page 48.**

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MEETINGS

Jan. 10 to 12—Institute of Scrap Iron and Steel, St. Louis.

Jan. 9 to 13—Society of Automotive Engineers, Detroit.

Feb. 14 to 17—Purchasing Agents Association, Indianapolis.

April 26 to 29—Electrochemical Society, Columbus, Ohio.

Commerce bids for Industrial Economics Bureau.—**Page 54.**

Addressograph-Multigraph Corp. sells bonds for $1,000,000 expansion program.—**Page 56.**

Manganese producers "Surprised" at Roosevelt defense statement.—**Page 56.**

Follansbee workers accept wage cut. —**Page 57.**

Order for unloader hoist go to Wellman.—**Page 57.**

Institute cites steel's imposing safety record.—**Page 57.**

NLRB orders Elkhart company to rehire four.—**Page 57.**

Globe Steel buys new equipment for $200,000 rehabilitation.—**Page 57.**

Steel Industry assails ruling of Contracts Board.—**Page 58.**

Monopoly committee ready to send questionnaires to steel companies. **Page 60.**

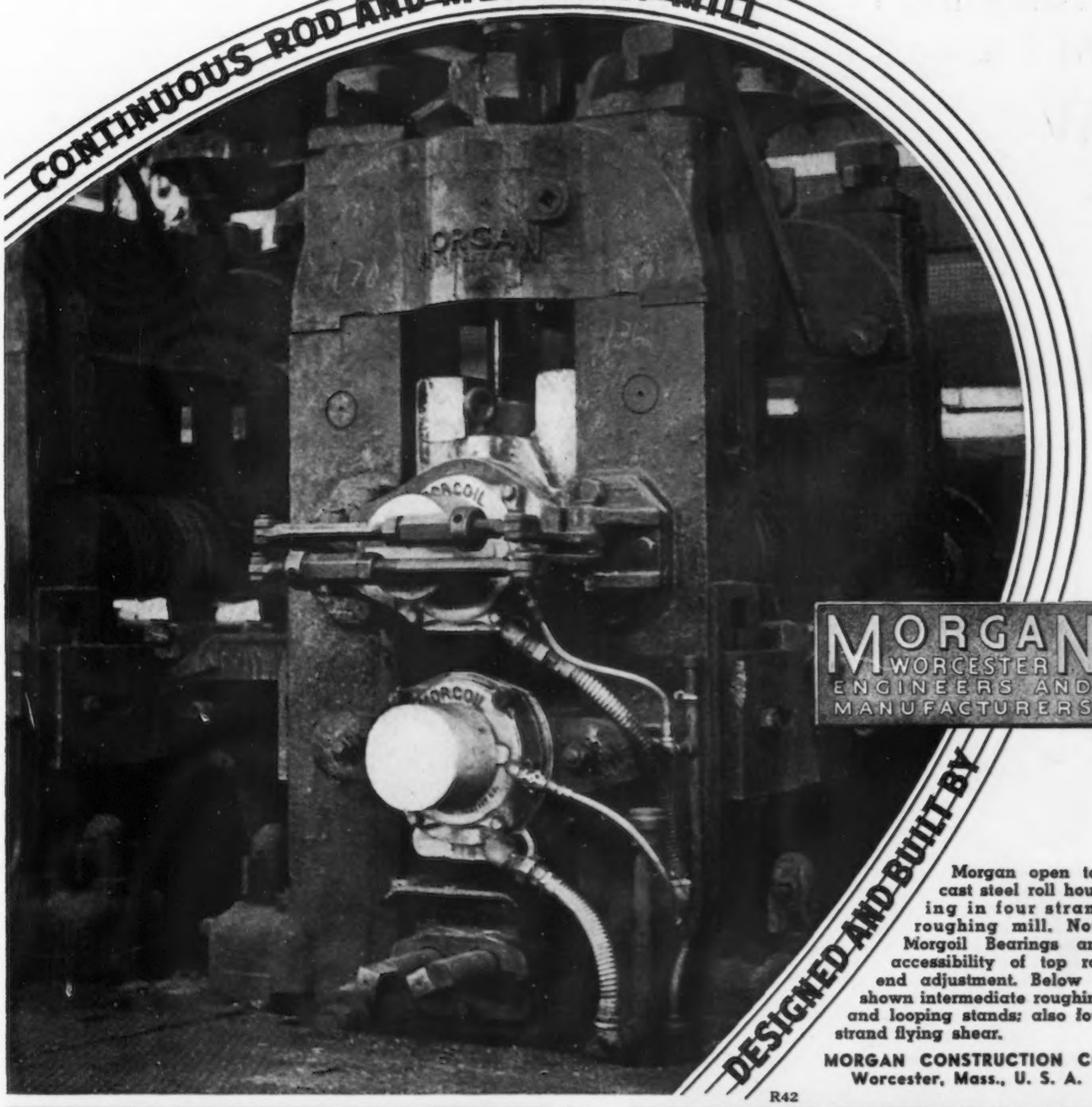
Navy awards more steel contracts.—**Page 60.**

November machine tool index drops to 112.2 in November from 118.1 in October.—**Page 80.**

Globe Steel Co. completes plant rehabilitation program costing $200,000.

V. G. Idens, American Institute of Steel Construction secretary, urges that Pittsburgh use elevated higways to solve traffic problems.

CONTINUOUS ROD AND MERCHANT MILL

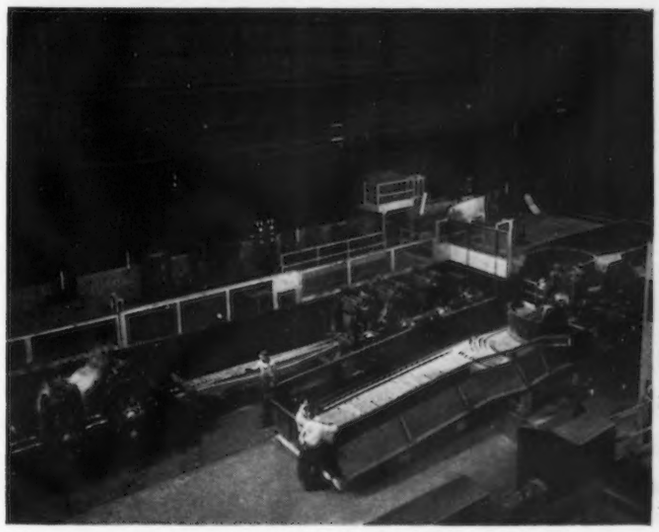


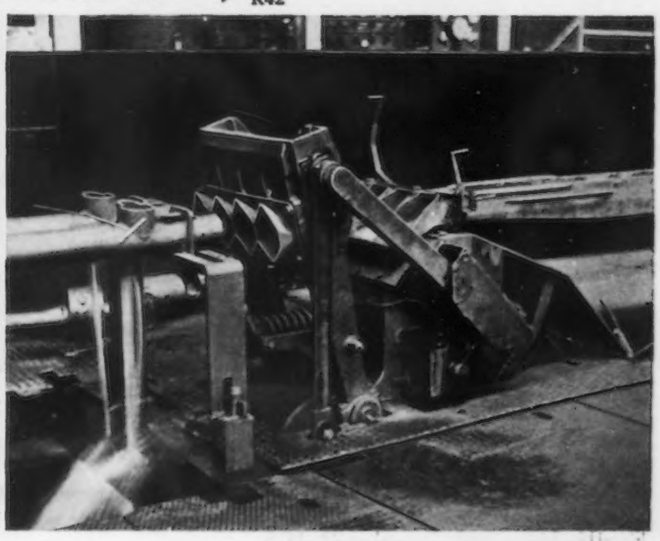
DESIGNED AND BUILT BY

Morgan open top cast steel roll housing in four strand roughing mill. Note Morgoil Bearings and accessibility of top roll end adjustment. Below is shown intermediate roughing and looping stands; also four strand flying shear.

MORGAN CONSTRUCTION CO.
Worcester, Mass., U. S. A.

R42





Manganese Producers "Surprised" At Roosevelt Defense Statement

WASHINGTON. — To President Roosevelt recently sped a letter expressing "surprise and amazement" that he said, under the national defense program, it would cost too much to stimulate the domestic manganese industry.

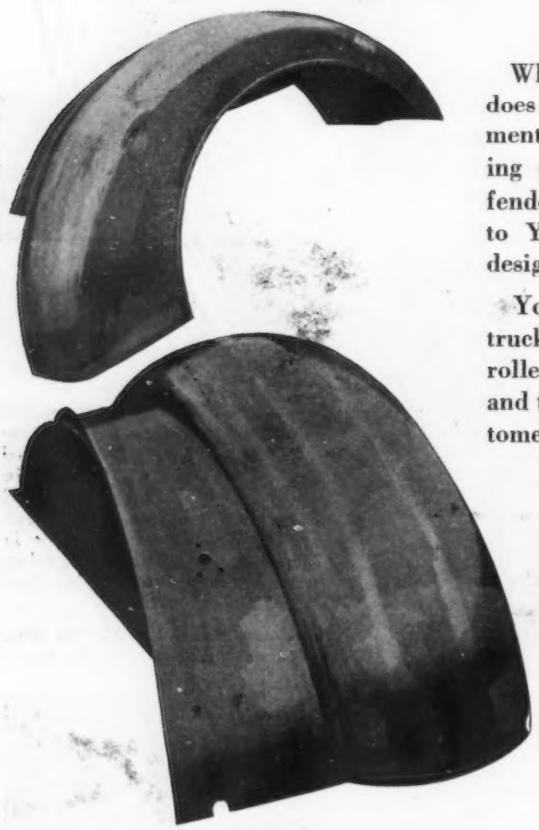
Never overlooking a bet in defense of the home produced strategic alloying material, the alert J. Carson Adkerson, head of the American Manganese Producers' Association, firmly but with Virginian courtesy reminded the President that for stockpile purposes the Navy Department recently purchased 11,500 tons of ferromanganese, "manufactured exclusively from domestic ores."

Espousing the Miller bill to supply stocks of American manganese for the military establishment, Mr. Adkerson assured the President that "all that domestic manganese producers ask is treatment for manganese on a parity basis with steel products."

Then removing the button from his restrained foil, Mr. Adkerson struck fiercely, if erringly, at the steel industry for using foreign ores. Reveling in an old line of attack, he produced the astronomical figure of $8,468,961,511—it looks like a New Deal annual budget—as the cost to the American public of the duties on crude and semi-finished steel only from the year 1922 to 1937, inclusive. Mr. Adkerson's authority? The more or less reliable halls of Congress.

To be specific, the figure was taken from an address by Representative Francis H. Case, Republican of South Dakota, in the House on June 15, 1938. How did Mr. Case arrive at this mountainous "cost"? By a simple, though amusing, calculation which even a second rate economist would repudiate. The South Dakota solon merely took the domestic consumption of "crude and semi-finished steel" and multiplied it by the rates of duty applying to such steel! He didn't content himself with a calculation, which itself would be faulty, of totaling duties on imports. One would suppose sound reasoning would recognize the important factor of competition.

Rolled Fenders *by* YORK



Where your production does not warrant the investment required for the building of tools for die drawn fenders, send your inquiries to York for their proposed design in rolled fenders.

York has been supplying truck and body builders with rolled fenders for many years and their host of satisfied customers is evidence of the class of work produced.

Whether you require fenderettes for trailers, fenders for commercial trucks, or the huge fenders required for fire apparatus, York is equipped and ready to handle your needs.

York specializes in deep drawn and formed stampings of all kinds and maintains a complete engineering department and a well equipped tool room for the building of tools for use in their modern press shop and assembly plant.

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Addressograph Begins $1,000,000 Expansion

CLEVELAND. — Following announcement of the sale of debentures which will make $1,000,000 available for additional improvement capital, the Addressograph-Multigraph Corp. here has awarded to the H. K. Ferguson Co. a contract for the design and construction of a plant addition providing 132,000 sq. ft. of floor space. The new structure, which will join the present large plant, will be under construction next month, according to present plans. Considerable machinery will be required for the plant addition.

The company, a large manufacturer of office machines, sold to an insurance firm $2,500,000 in 15-year debentures, with interest at 3⅝ per cent and with sinking fund requirements of $150,000 annually. The money will provide $1,500,000 to refund debentures which have been called.

Follansbee Workers Accept Wage Cut

FOLLANSBEE, W. VA.—Employees of the Follansbee Brothers Co. are reported to have voted at a secret meeting recently to take a 15 per cent wage cut in order to maintain operations. The company which has plants located here and at Toronto, Ohio, is now being reorganized under section 77B of the Federal Bankruptcy Act. The wage cut is interpreted generally as an isolated instance in the steel industry. Trustees approved the reduction.

Orders for Unloader Hoist Go to Wellman

CLEVELAND.—The contract for a stationary Hulett type unloader for removing rubbish, garbage and refuse from barges has been awarded to the Wellman Engineering Co., Cleveland, by the department of sanitation of the City of New York. The main frame of the unloader will be stationary. Capacity of the bucket will be 12 cu. yd.

The company recently received an order for a large electric mine hoist having two 11-ft. diameter by 8 ft. 6 in. drums with power operated brakes and clutches for a large Canadian mining company. These orders with other business now in the plant will keep the Wellman force busy the next seven months. The company is employing 225 to 250 workmen.

Institute Cites Steel's Imposing Safety Record

THE steel industry has built an imposing record of safety upon a solid foundation of cooperation between men and management, the American Iron and Steel Institute says in a recently issued booklet on "Safety in Steel."

"Even though these advances have been remarkable, the safety movement calls for eternal vigilance, and endless striving for still further achievements," the booklet says.

NLRB Orders Elkhart Company to Rehire Four

WASHINGTON.—The National Labor Relations Board has ordered C. G. Conn, Ltd., Elkhart, Ind., to reinstate, with remedial wages, four employees refused reinstatement in October, 1935, in the course of a strike. The board found that the refusal to reinstate at that time was intended to discourage membership in the Metal Polishers International Union, Local No. 77, an affiliate of A. F. L. The board also has ordered American Numbering Machine Co., Brooklyn, upon request, to bargain with the International Association of Machinists, District No. 15 (A. F. L.), as sole collective bargaining representative of the company's production employees, and to embody in an agreement with the union any understanding reached.

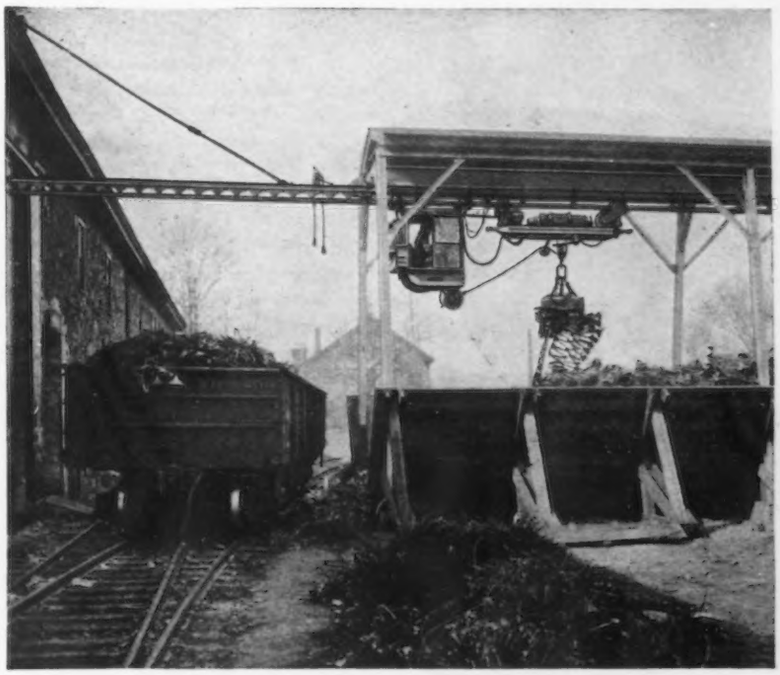
Globe Steel Buys New Equipment

MILWAUKEE. — Globe Steel Tubes Co., Milwaukee, is completing an extensive plant rehabilitation program at an investment upward of $200,000. Among the installations of new equipment is a new controlled-atmosphere annealing furnace, one of three in the industry. A butane gas system also has been installed, as well as a 550-1200-hp. single drum type boiler.

CLEVELAND TRAMRAIL

MATERIALS HANDLING EQUIPMENT

In the Metal Working Industry



● Jib cranes are efficient equipment for extending Cleveland Tramrail over railroad tracks or for servicing cars and loading docks.

● Moving of scrap from the shop floor to storage bins or car is done inexpensively with a cab controlled carrier and electro magnet.

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Steel Industry Assails Wage Ruling of Contracts Board

WASHINGTON. — Arguments that the Public Contracts Board's steel wage recommendations endanger the competitive position of many units in the industry, that Congressional sponsors of the Public Contracts Act never intended it should be a wage fixing law, and that the board showed a complete ignorance of the act in the steel wage case were presented to Assistant Secretary of Labor McLaughlin on Tuesday by members of the industry, by Representative Walter, Dem., Pa., co-sponsor of one of the early public contracts bills, and by Donald R. Richberg, former NRA Administrator.

Referring to the 62.5c. minimum rate which the board recommended for 36 states in the North, Fred A. Ferrar, of the Colorado Fuel & Iron Co., Denver, said that the proposed rate would put his company at too much of a competitive disadvantage with mills in Chicago, Pittsburgh, Youngstown, Ohio, and Sparrows Point, Md., which, he said, have the advantage of water haul rates to Pacific Coast and Gulf ports. He said it had always been the policy of his company to pay fair and equitable wage rates but that the minimum wage proposed by the board would "cost us more than we can reasonably bear."

Not Sponsors' Object

Representative Walter explained that none of the Congressional sponsors of the act intended to empower the Secretary of Labor to fix wages but merely to determine prevailing labor rates to remedy wide disparities prevailing in wage rates within localities. The Congressman ridiculed the idea that the board could group, for example, Denver and Sparrows Point within the same wage locality within the meaning of the law.

Mr. Richberg, appearing as counsel for the Sheffield Steel Corp., Kansas City, told the Labor Department representative that he saw no possibility for sustaining the legality of the board's recommendations which he said displayed a complete ignorance of the legal requirements of the act. He described the board's definition of the term "locality" as contained in the act as "laughable."

H. P. Bigler, director of the Rail Steel Bar Association, Chicago, asked that size and character of the mills be considered by the board in fixing further differentials, pointing out that the rate recommended would mean "a substantial raise" above wages being paid common labor by his company. H. W. Boal, treasurer of the Andrews Steel Co., Newport, Ky., protested that if made effective, the board's recommendations would repudiate contracts in which his company had entered with employees and that only a 52.5c. minimum wage rate would permit his company to compete with northern mills.

J. T. Whiting Protests

Further geographical differentials were urged by John T. Whiting, of the Alan Wood Steel Co., Conshohocken, Pa., who told Mr. McLaughlin that his company was one of two in the eastern district having wholly integrated facilities. He pointed out that the board concedes that further study is required on certain phases of its recommendations but that he couldn't understand why these studies should be made after an order becomes final.

O. R. Strackbein, the member of the board who wrote a minority opinion recommending five wage districts as compared with the two districts proposed by the majority, was the only board member in attendance. He sat at the rear of the hearing room. McLaughlin merely called on each scheduled witness but made no comment. Other steel spokesmen early Tuesday included L. S. Harding, Crucible Steel Co., New York; James R. Remsen, Rustless Iron & Steel Corp., Baltimore; William B. White, of Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.

Bethlehem Files Brief

Taking exception to the steel wage recommendations on the grounds that many of the points suggested by the board are misleading, indefinite and immaterial, the Bethlehem Steel Corp. filed a 94-page brief and 19 exceptions on Monday, charging that the recommendations are contrary to the provisions of the act because they fail to recognize existing wage differentials.

The brief, which was filed by the company's counsel, Cravath, De Gersdorff, Swaine and Wood, of New York, declared that neither the majority nor the minority report indicated that the law had been properly applied in the steel wage proceedings. It

quoted excerpts from testimony before the Senate Judiciary Committee while the Public Contracts Act was pending in Congress in substantiation of the claim that the majority of the board had erred when it recommended a minimum wage in the steel industry of 62.5c. in 36 states in the North and 45c. in 12 states in the South without taking into account long established differentials between various districts.

The brief maintained that further studies, as recommended by the board covering the effect of its recommendations on small plants, the applicability of the action to tin plate mills, should not be deferred until the secretary's final order is issued but should be made prior to the secretary's final order and not deferred. The company also took exception to the administrator's refusal to re-submit the proceedings to the board for a further investigation.

. . . PIPE LINES . . .

Department of Public Safety, Harrisburg, Pa., William T. DeHart, director, closes bids Dec. 28 for about 2½ miles of 42-in. pipe for main city water line, with alternate bids on coated steel pipe, cast iron pipe, or reinforced-concrete pressure pipe. This is first section of a new 21-mile main trunk line for water system. Gannett, Eastman & Fleming, Inc., 600 North Second Street, Harrisburg, is consulting engineer.

Hope Engineering Co., 100 East Forty-second Street, New York, has plans for new 8-in. welded steel pipe line, about 350 miles long, from K-M-A oil field district in Wichita County, Tex., to a point on Gulf coast, for crude oil transmission. Oil will be secured from wells of several independent operators in territory noted, covering about 10,000 acres of K-M-A oil area, and steel pipe line gathering system will be installed. Project will include pumping stations along route and operating facilities to provide daily capacity of about 25,000 bbl. A bulk terminal will be located at Gulf coast terminus for barge shipments. Surveys will be placed under way at once, with construction scheduled to begin early in 1939. Cost over $6,000,000. B. E. Hepler is president.

Metropolitan Utilities District, Eighteenth and Harney Streets, Omaha, Neb., Col. T. A. Leisen, secretary, plans pipe lines for gas distribution in districts Nos. 835-848, inclusive, recently created.

Board of Contract and Supply, Metropolitan District, Municipal Building, Hartford, Conn., asks bids until Jan. 9 for 30 and 36-in. pipe line in Hillside Avenue, Hamilton, Ward and Washington Streets and Park Terrace, about 1¼ miles, for main water supply, alternate proposals to be considered for electrically-welded steel pipe of ½-in. plates, double-dipped in asphalt enamel or coal tar pitch, and reinforced-concrete cylinder pipe.

Spartanburg, S. C., has awarded contract to Dixie Culvert & Metal Co., Forsyth Building, Atlanta, Ga., representing American Rolling Mill Co., Middletown, Ohio, for 39,380 ft. of 24-in. and 16,000 ft. of 20-in. steel pipe, at $181,818, for main water lines. This is part of an expansion and improvement program in water system to cost about $600,000.

Treasury Procurement Office, San Francisco, asks bids on 8000 ft. of 10-in. pipe f.o.b. Lindsay, Cal. (Invitation 6717), and 1000 ft. of 28-in. pipe f.o.b. Terra Bella, Cal. (Invitation 6718).

To the far corners of both B-G-R plants go the specification sheets of countless spring orders, to meet in the shipping room, formed in metal in an astonishing array of shapes and sizes. All along the way, there is never-ceasing vigilance, alert checking and testing—the sometimes "fussy" attention that gets things right. Hit-or-miss methods are not tolerated at B-G-R.

We prefer the modern way—which gives you the advantages of up-to-date methods and materials—and springs of proven value. *Have your next orders for springs, wire forms and small stampings filled by B-G-R.*

BARNES-GIBSON-RAYMOND

DETROIT PLANT DETROIT, MICHIGAN ← DIVISION OF ASSOCIATED SPRING CORP TWO PLANTS → COOK PLANT ANN ARBOR, MICHIGAN

POLISH and BUFF

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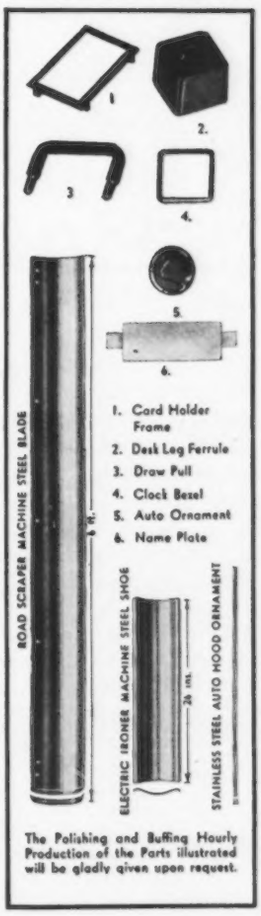

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PACKER Machines are increasing production and cutting finishing room costs in all types of industry—large and small parts, unusual shapes and difficult color match efficiently Polished and Buffed—Automatically.

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MACHINES

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Industry Speaks

GEORGE H. DAVIS, president, United States Chamber of Commerce — "The American people must choose whether they prefer 72 people in one department, sending out information and propaganda, which includes turkey-tasters, recipes for baby pants, etc., or whether they desire that money left with men, labor and management, that created it, to be used in expansion of new enterprise, and to develop new inventions, which will make more jobs, lower costs, greater distribution and a higher standard of living."

Industry Listens

"We Americans have had our family disputes and may continue to have them, but let me say that anyone would be making a great blunder to mistake these differences for disunity, for in the end we will always unite against any outside agressor." — ALFRED M. LANDON.

"The country is suffering from high blood pressure. I shall not undertake on this occasion to discuss the causes of this condition. No common agreement can be reached by the diagnosticians, but we must agree that if the exercise has been too violent, some modification must be employed and proper diet and rest be prescribed." — SENATOR PAT HARRISON, Dem., Miss.

"History has shown that Washington set a precedent which no man has been able to break down. President Grant could not do it. That popular, dynamic character, Theodore Roosevelt, did attempt a third term, and if the present Roosevelt tries to get a third term he will be defeated even if his own party made him its nominee." — SENATOR McNARY, Rep., Ore.

Monopoly Committee Ready to Send Questionnaires to Steel Companies

WASHINGTON.—The Department of Justice — Federal Trade Commission questionnaire to be used by the Temporary National Economic Committee in connection with its inquiry into the iron and steel industry has been printed and is ready to be mailed to some 50 or 60 steel executives.

The questionnaire is elaborate and designed to provide an exhaustive analysis of practices in the industry. It deals broadly with such subjects as the basing point system, costs, prices, capacity, production and distribution. Not only is it the purpose to develop fully the policies of steel companies on these and related matters but to make a breakdown regarding them by individual units and products of each producer. That preparation of the data will involve considerable time and expense by steel producers is evident.

But this will be only a part, perhaps a relatively small part, of the demands to be made on the industry. For it was stated that much additional information will be sought from the hearings before the committee, which will be protracted and probably more extensive than any that will be conducted by the TNEC. Authorities said it is not as yet known how many steel representatives will be called or who they will be. It was indicated, however, that the list will be long and embrace not only prominent administrative and financial executives but others who occupy managing and operating positions throughout the industry.

No time has been set for the steel inquiry. It likely will not begin for several weeks after the TNEC resumes its sessions following its holiday adjournment. Meanwhile the committee will prepare a schedule of procedure involving the manner of order of hearings. Up to the present committee hearings have covered only one subject—patents. But it has not yet been determined whether the committee, with a two-year period to go, unless meanwhile it switches its huge economic streamlining to a Bureau of Industrial Economics or some such set-up, will go in for hearings by topics or industries. It may even require several weeks to decide upon this program because of possible differences between the legislative and administrative members of committee.

The steel questionnaire is based on replies sent out by the TNEC asking steel companies to tell how they keep their record. This letter of inquiry was drafted after representatives of the TNEC conferred in New York with steel interests.

Replies to the letter, it was stated, showed a diversity of practices of keeping records in the industry. The form of the questionnaire therefore, it was pointed out, was modified instead of fully following the original tentative draft. The questionnaire also was sent to the Government Printing Office before all of the replies had been received, including some from the larger steel companies. It was stated that the committee was anxious to have the questionnaire printed and ready for distribution and not knowing how much longer it would be before it received replies from the larger companies, it sent the questionnaire to the Government Printing Office without longer awaiting the replies. Subsequently, it was said, replies from all save two of the larger companies had been received.

Navy Awards More Steel Contracts

WASHINGTON. — The Navy Department has announced award of the following contracts:

Enterprise Galvanizing Co., Philadelphia, steel shapes, $11,625; Carnegie-Illinois Steel Corp., steel shapes, $7600; Shaw-Kendall Engineering Co., Toledo, steel tubing, $13,159; Ross Galvanizing Works, Brooklyn, steel shape, $39,000; Gisholt Machine Co., Madison, Wis., lathes, $50,981; Lehman Machine Co., St. Louis, lathes, $11,155; Lebanon Steel Foundry, Lebanon, Pa., steel propeller castings, $7760.

REINFORCING STEEL

. . . Awards of 8925 tons; 19,300 tons in new projects.

NORTH ATLANTIC STATES AWARDS

2500 Tons, Brooklyn, Meeker Avenue bridge, to Igoe Bros., Newark, N. J., through Reiss & Weinser, Inc., Brooklyn.

500 Tons, Cape May, N. J., bridges, to Bethlehem Steel Co., Bethlehem, Pa.; includes some welded mesh.

400 Tons, Wayne County, N. Y., highway project R.C.-4006, to Bethlehem Steel Co., Bethlehem, Pa., through Warren Bros. Roads Co., Cambridge, Mass.

350 Tons, Seneca County, N. Y., highway project R.C.-3997, to American Steel & Wire Co., New York, through Bero Engineering & Construction Corp., North Tonawanda, N. Y.

250 Tons, Schenectady County, N. Y., highway project R.C.-3996, to American Steel & Wire Co., New York, through Law Brothers Contracting Corp., Herkimer, N. Y.

200 Tons, Yates County, N. Y., highway project R.C.-3991, to Wickwire Spencer Steel Co., Buffalo, through Mohawk Paving Co., Inc., Buffalo.

100 Tons, Wilmington, Del., elementary and high school, to Taylor-Davis, Inc., through Rupert & Fulenwilder, contractors.

CENTRAL AND WESTERN STATES

3800 Tons, Chicago, subway, to Herlihy Mid-Continent Co., contractor.

300 Tons, Racine, Wis., filtration plant, to Truscon Steel Co., Youngstown.

280 Tons, Cleveland, Big Creek culvert in Brook Park, to Patterson-Leitch Co., Cleveland.

120 Tons, Lexington, Va., library building, Virginia Military Institute, to Easterby-Mumaw, through J. A. Jones, Charlotte, N. C., contractor.

114 Tons, Moline, Ill., Roosevelt High School, to Bethlehem Steel Co.

PENDING REINFORCING BAR PROJECTS

NORTH ATLANTIC STATES

13,500 Tons, Southboro - Framingham - Natick-Weston, Mass., State water project, previously reported as 5000 tons.

575 Tons, Elmira, N. Y., reformatory.

500 Tons, Putnam County, N. Y., contract No. 321, Delaware Aqueduct; bids in.

CENTRAL AND WESTERN STATES

2750 Tons, Chicago, section S-7, Chicago subway; bids Jan. 5.

1486 Tons, Mare Island, Cal., quay wall; Healy-Tibbetts Construction Co., San Francisco, low bidder.

1120 Tons, Los Angeles, Metropolitan Water District; bids Dec. 28.

580 Tons, Cleveland, Gordon Park lake front development.

550 Tons, Billings, Mont., high school; bids Dec. 22.

415 Tons, Sandusky, Ohio, waterworks, National Construction Co., Cleveland, general contractor (tonnage previously reported).

400 Tons, Cleveland Veterans' Hospital.

400 Tons, Fort Sill, Okla., barracks.

360 Tons, Cleveland, East Ninth Street, lake front development.

325 Tons, Portland, Ore., medical school addition; Ross B. Hammond, Portland, low bidder.

300 Tons, Anderson, Ind., sewage plant, T. V. Love, Akron, O., low bidder on general contract. Tonnage previously reported.

268 Tons, Lafayette, Ind., addition to Purdue University Union Building, A. E. Kemmer, contractor.

260 Tons, Liberty Lake Junction, Wash., Spokane River bridge; bids Jan. 4.

250 Tons, Iowa City, Courier Hall, University of Iowa, C. C. Larson, Council Bluffs, Iowa, general contractor.

200 Tons, Iowa City, Iowa, University building.

200 Tons, Madison, Wis., Burroughs School.

172 Tons, Kent, Ohio, McGilvrey Hall of Kent State University; bids in.

150 Tons, Terre Haute, Ind., building for Indiana State Teachers College; bids in.

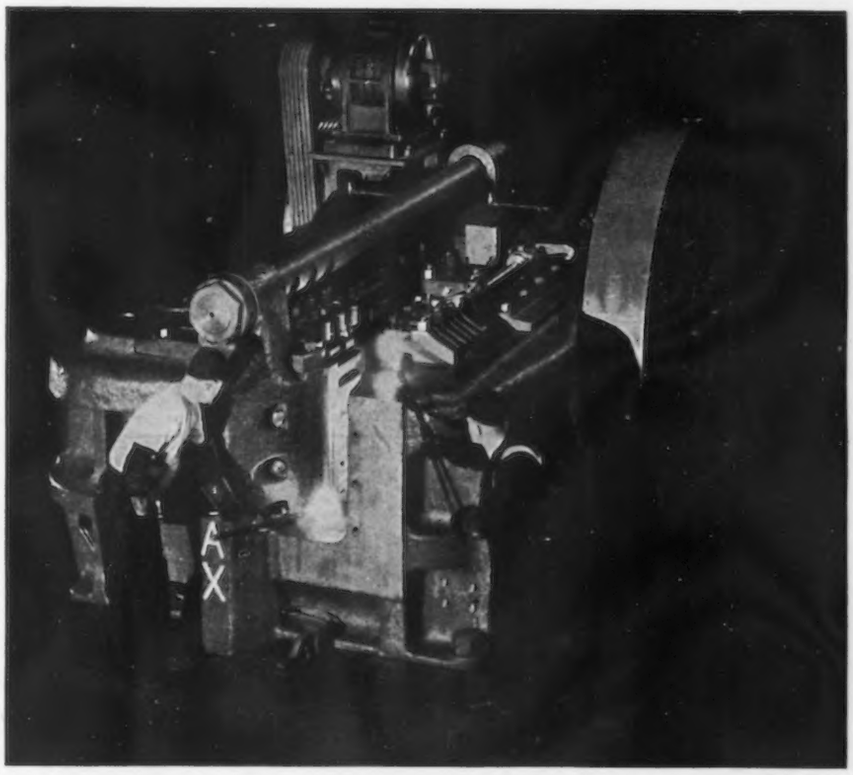
115 Tons, Mansfield, Ohio, South Junior High School. Steinle-Wolfe Construction Co., general contractor.

108 Tons, Sacramento, Cal., sewage disposal plant.

Unstated tonnage, Pendleton, Ore., court house.

Unstated tonnage, Dillon, Mont., high school.

Unstated tonnage, Seattle, Wash., E. 45th Street viaduct; western Construction Co., Seattle, low bidder.



USERS REPORT GAINS OF 25%

● Because of the instant response of the air clutch, the new Ajax Forging Machines are more productive than any previously developed. Substantial production increases, as much as 25%, are reported to us by users.

On these new Ajax machines output is limited principally by the amount of stock the operator can feed during his work shift. Effortless tripping and convenient feed-gap design enable him to stand with weight on both feet in a natural, well balanced position. And the instantaneous action of the clutch materially lessens the time he must support the bar between the dies.

These fatigue-lessening improvements which result in profit-paying gains in output merit your immediate investigation.

THE AJAX MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND
621 MARQUETTE BLDG., CHICAGO • 201 DEWART BLDG., NEW LONDON

AJAX

Commerce Department Bids for Industrial Economics Bureau

WASHINGTON.—The Commerce Department's bid for harboring the proposed new Bureau of Industrial Economics, which President Roosevelt recommended last April as a means of bringing industrial production more into line with consumption, was made public in its annual report on Tuesday, just 20 days after the Federal Trade Commission had represented itself to the White House as being "Fully Implemented" with powers to collect and publish market information as a guide for business.

"The Department of Commerce," the report said, "is attempting to study many of these problems (of fluctuations in industrial activity, price trends, and changes in consumer demand) with the purpose of clarifying the general understanding of business operation and aiding business men in better administration of their own enterprises. Facilities for this work, however, are still woefully lacking."

"The Federal Trade Commission is fully implemented with such expressly granted powers, but has not been able to use them effectively for lack of appropriations."

Business Opposed

The commission, which also recalled that it has been identified for many years with the proposal to collect business statistics as a method of cushioning severe changes of the business cycle, actually was given funds back in 1919 to start work in this direction but litigation halted its efforts and Congress cut off further money. Many companies rebelled against the mandatory gathering of reports although the FTC's power was subsequently upheld in the courts.

The Commerce Department only last year had money appropriated as a step in that direction but, out of $100,000 allocated, the bulk was impounded for other purposes. In its report last week, the department listed construction and related durable goods industries as ones in which more research should be undertaken promptly for the purpose of appraising trends covering production, sales, inventories, credit, distribution costs, trade practices, price changes, and consumer needs.

Richberg Objects

In the meantime, rumors persist that the Administration will push for the so-called Bureau of Industrial Economics early in the next session of Congress. Objections to the FTC, however, may bar it from being the selected agency. Donald Richberg, White House adviser and a persistent advocate of such a bureau, has warned against either the FTC or the Justice Department performing the function on the ground that they are prosecuting arms of the Government. At the same time it is not thought the Administration favors setting the bureau up in the Department of Commerce.

Announcing!

Drawbenches for steel and non-ferrous tubes and bars, with conventional electric drive or automatic AC or DC drive for slow starting and acceleration to the drawing speed.

Push button control initiates the completely automatic drawing cycle, automatic arms facilitating removal of the tube or bars.

The automatic draw grip permits quicker interchange of the draw bits for size and for multiple draw.

PATENT APPLIED FOR

Faster grip return with automatic deceleration and air cushioned stop with positive positioning for gripping the tube or bar points, increases production and diminishes point scrap.

We solicit your inquiries for tube and bar drawbenches. We also build complete tube forming, sizing, welding and cut-off equipment.

Wallace W. Kerr, who has devoted the last 20 years to the development of drawbench machinery is now associated with McKay in the engineering and sales of their new line of drawbench machinery and equipment.

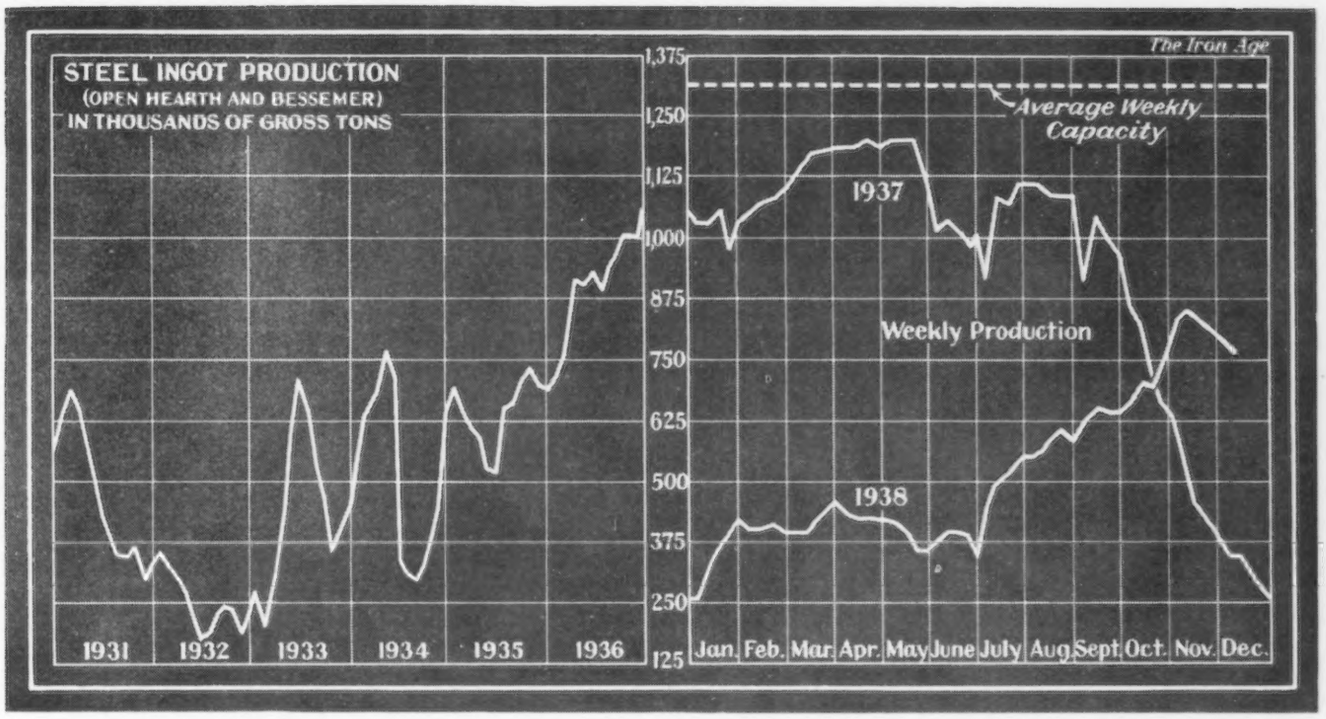
McKAY

THE McKAY MACHINE COMPANY

ENGINEERS AND MANUFACTURERS OF SHEET, TIN AND STRIP MILL EQUIPMENT

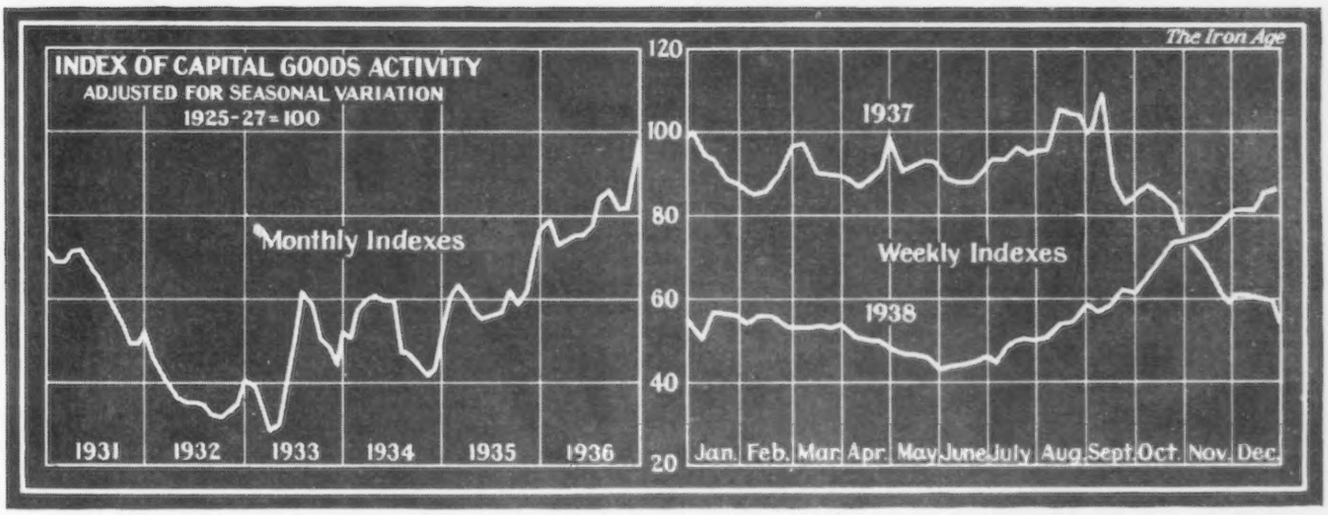
YOUNGSTOWN, OHIO

Ingot Output Down Five Points to 53 Per Cent



District Ingot Production, Per Cent of Capacity	Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Wheel-ing	Buffalo	Detroit	Southern	S. Ohio River	Western	St. Louis	East-ern	Aggre-gate
CURRENT WEEK..	39.0	56.0	42.0	34.0	49.0	74.0	43.0	90.0	68.0	63.5	40.0	59.0	75.0	**53.0**
PREVIOUS WEEK..	41.0	60.5	55.0	36.0	57.0	86.0	43.0	89.5	65.0	62.0	40.0	59.0	75.0	**58.0**

Index Advances Despite Losses in Two Components



TWO important steel consumers, the construction and the automobile industries, were responsible for the contraseasonal improvement shown by THE IRON AGE capital goods index for the week ended Dec. 17. This increase, amounting to 0.7 point, raised the index to 83.5, the highest point reached in 14 months, or since the week ended Oct. 16, 1937. Moderate declines recorded by both the steel production and the Pittsburgh series were a forerunner of the probable trend of the index over the next three weeks. According to present indications, the year-end slackening of activity will not be pronounced.

	Week Ended Dec. 17	Week Ended Dec. 10	Comparable Week 1937	Comparable Week 1929
Steel ingot production[1]	94.7	95.4	42.2	93.9
Automobile production[2]	103.1	99.3	82.1	46.5
Construction contracts[3]	87.2	85.4	59.3	102.9
Forest products carloadings[4]	62.0	61.5	59.4	114.0
Production and shipments, Pittsburgh District[5]	70.5	72.5	57.7	104.0
Combined index	**83.5**	**82.8**	**60.1**	**92.2**

Sources: 1. THE IRON AGE; 2. Ward's Automotive Reports; 3. *Engineering News-Record*; 4. Association of American Railroads; 5. University of Pittsburgh.

. . . SUMMARY OF THE WEEK . . .

. . . Railroad orders and construction awards outstanding.

° ° °

. . . General business is quiet, but not off sharply.

° ° °

. . . Automobile manufacturers expected to buy early in January.

RAILROAD orders and construction awards this week account for large tonnages of steel which will benefit the mills early next year, while in the meantime other lines are restricting their purchases to a moderate extent as a measure of year-end inventory curtailment.

The placing of 50,000 tons of rails by the Pennsylvania and orders for 2100 freight cars, requiring upward of 25,000 tons of steel, from the Norfolk & Western are the only large items among railroad purchases. The Chicago Great Western has ordered 4200 tons of rails and 2800 tons of accessories. The Chesapeake & Ohio will buy tie plates and spikes to accompany its recent rail purchase. Other rail orders are in early prospect.

Awards of structural steel for construction projects totaled about 50,000 tons in the week, headed by 16,500 tons for the Criminal Courts Building, New York, while more than 20,000 tons came into the market for bids. Reinforcing bar lettings were also fairly substantial at about 9000 tons and new work includes one lot of 13,500 tons for a Massachusetts State water project.

WHILE steel business generally has slowed up this month, there is no serious falling off in aggregate tonnage. A drop of five points in ingot production for the country to 53 per cent may be accounted for in part by the fact that steel companies also are anxious to keep their stocks of raw steel at a minimum over the inventory period and are reducing the number of active steel making furnaces to conform closely to actual requirements over the next two weeks. Some open hearth departments will be shut down from Friday night until Tuesday, others from Saturday until Tuesday, depending in each case on the amount of ingots and semi-finished steel on hand.

The downward trend is not uniform, however, as a few districts have shown moderate gains this week. The Detroit district has the highest operating rate in the country, 90 per cent, a gain of a half point. The Birmingham district is also doing fairly well owing to rail tonnage and other orders, having gained three points to 68 per cent. There has also been a slight gain in southern Ohio. There were sharp declines, however, in the Wheeling-Weirton, Cleveland-Lorain and Youngstown districts, with lesser losses at Pittsburgh and Chicago.

Regardless of what happens to operations next week, it is indicated that the ingot rate at the beginning of the new year will be somewhere around 50 per cent, or approximately double the rate at which 1938 was ushered in.

Cold rolling units of continuous sheet mills will be kept busy through the holiday period in an effort to get out an accumulation of specifications resulting from the orders booked in October at low prices. Some carryover into the new year is certain as one large producer is quoting early February deliveries on cold rolled sheets.

Automobile companies are expected to come into the market early in January for further requirements, the amounts depending on the trend of retail sales this month.

Shipbuilding requirements for the new year are building up. With the award of three passenger-cargo boats to the Bethlehem Steel Co., the Maritime Commission has ordered 50 ships during 1938, many of which will not be completed for a year or more. The steel requirements for the latest boats awarded total 13,110 tons and for the entire program thus far upward of 200,000 tons, only part of which has already been rolled.

The scrap trade is marking time pending the clarification of first quarter steel prospects. Prices are steady, but show no tendency to advance further at this time. Negotiations are in progress between American scrap dealers and the International Scrap Cartel in London which may result in the purchase of a large tonnage for export from the United States.

STEEL manufacturers and their counsel descended on Washington on Tuesday in violent protest against the minimum wage decision of the Public Contracts Board of the Department of Labor, which, it was contended, could be justified neither on economic nor legal grounds. Meanwhile, the long period of quiet in steel wage discussions between companies and their employees has been broken at the plants of the Follansbee Brothers Co., where the workers voted to accept a 15 per cent cut so that the plants can operate without loss.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Rails and Semi-finished Steel

Per Gross Ton:	Dec. 20, 1938	Dec. 13, 1938	Nov. 22, 1938	Dec. 21, *1937
Rails, heavy, at mill	$40.00	$40.00	$40.00	$42.50
Light rails: Pittsburgh, Chicago, Birmingham	40.00	40.00	40.00	43.00
Rerolling billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point.	34.00	34.00	34.00	37.00
Sheet bars: Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point	34.00	34.00	34.00	37.00
Slabs: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	37.00
Forging billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham	40.00	40.00	40.00	43.00
Wire rods: Nos. 4 and 5, Pittsburgh, Chicago, Cleveland	43.00	43.00	43.00	47.00
Skelp, grvd. steel: Pittsburgh, Chicago, Youngstown, Coatesville, Sparrows Point, cents per lb.	1.90	1.90	1.90	2.10

Finished Steel

Cents Per Lb.:				
Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.25	2.25	2.25	2.45
Plates: Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont	2.10	2.10	2.10	2.25
Structural shapes: Pittsburgh, Chicago, Gary, Buffalo, Bethlehem, Birmingham	2.10	2.10	2.10	2.25
Cold finished bars: Pittsburgh, Buffalo, Cleveland, Chicago, Gary	2.70	2.70	2.70	2.90
Alloy bars: Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton	2.80	2.80	2.80	3.00
Hot rolled strip: Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown, Birmingham	2.15	2.15	2.15	2.40
Cold rolled strip: Pittsburgh, Cleveland, Youngstown	2.95	2.95	2.95	3.20
Sheets, galv., No. 24, Pittsburgh, Gary, Sparrows Point, Buffalo, Middletown, Youngstown, Birmingham	3.50	3.50	3.50	3.80
Hot rolled sheets: Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown	2.15	2.15	2.15	...
Cold rolled sheets: Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown	3.20	3.20	3.20	...
Wire nails: Pittsburgh, Chicago, Cleveland, Birmingham	2.45	2.45	2.45	2.75
Plain wire: Pittsburgh, Chicago, Cleveland, Birmingham	2.60	2.60	2.60	2.90
Barbed wire, galv.: Pittsburgh, Chicago, Cleveland, Birmingham	3.20	3.20	3.20	3.40
Tin plate, 100 lb. base box: Pittsburgh and Gary	$5.00	$5.00	$5.00	†$5.35

*Pittsburgh prices only.
†Subject to post-season adjustment.

Pig Iron

Per Gross Ton:				
No. 2 fdy., Philadelphia	$22.84	$22.84	$22.84	$25.76
No. 2, Valley furnace	21.00	21.00	21.00	24.00
No. 2, Southern Cin'ti	21.06	21.06	21.06	23.89
No. 2, Birmingham	17.38	17.38	17.38	20.38
No. 2, foundry, Chicago†	21.00	21.00	21.00	24.00
Basic, del'd eastern Pa.	22.34	22.34	22.34	25.26
Basic, Valley furnace	20.50	20.50	20.50	23.50
Malleable, Chicago†	21.00	21.00	21.00	24.00
Malleable, Valley	21.00	21.00	21.00	24.00
L. S. charcoal, Chicago	28.34	28.34	28.34	30.24
Ferromanganese, seab'd carlots	92.50	92.50	92.50	102.50

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$15.75	$15.75	$15.50	$13.75
Heavy melting steel, Phila.	15.25	15.25	14.75	14.25
Heavy melting steel, Ch'go.	13.75	13.75	14.75	12.75
Carwheels, Chicago	12.50	12.50	13.00	15.50
Carwheels, Philadelphia	16.75	16.75	16.75	16.25
No. 1 cast, Pittsburgh	15.50	15.50	15.50	16.25
No. 1 cast, Philadelphia	16.75	16.75	16.75	16.75
No. 1 cast, Ch'go (net ton)	12.50	12.50	12.75	12.50

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.75	$3.75	$3.75	$4.00
Foundry coke, prompt	4.75	4.75	4.75	5.00

Non-Ferrous Metals

Cents per Lb. to Large Buyers:				
Electrolytic copper, Conn.	11.25	11.25	11.25	10.125
Lake copper, New York	11.375	11.375	11.375	11.125
Tin (Straits), New York	46.00	46.00	46.00	42.375
Zinc, East St. Louis	4.50	4.50	4.75	5.00
Zinc, New York	4.89	4.89	5.14	5.35
Lead, St. Louis	**4.70**	4.60	4.95	4.60
Lead, New York	**4.85**	4.75	5.10	4.75
Antimony (Asiatic), N. Y.	14.00	14.00	14.00	14.50

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
December 20, 1938	2.286 a Lb.	$20.61 a Gross Ton	$14.92 a Gross Ton
One week ago	2.286	20.61	14.92
One month ago	2.286	20.61	15.00
One year ago	2.512c.	23.25	13.58

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

Based on average basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel HIGH	Finished Steel LOW	Pig Iron HIGH	Pig Iron LOW	Steel Scrap HIGH	Steel Scrap LOW
1938	2.512c., May 17	2.211c., Oct. 18	$23.25, June 21	$19.61, July 6	$15.00, Nov. 22	$11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 16
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.73, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 23
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 30
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.223c., Apr. 2	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.192c., Dec. 11	2.142c., July 10	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 17	13.08, Nov. 22

. . THIS WEEK'S MARKET NEWS . .

STEEL OPERATIONS

. . . Ingot rate for the country estimated at 53%

THE estimate of THE IRON AGE of ingot production this week is 53 per cent, down five points from last week. The estimate of the American Iron and Steel Institute, issued on Monday, was 51.7 per cent.

There have been sharp declines in some districts, but there have also been increases, indicating that the trend is not all one way.

DETROIT is up half a point to 90 per cent, the BIRMINGHAM district has gained three points to 68 per cent and the SOUTHERN OHIO district has advanced a point and a half to 63.5 per cent.

The sharpest drops were in districts where capacity for the rolling of flat rolled steels predominates. The YOUNGSTOWN district is down 13 points to 42 per cent, CLEVELAND-LORAIN down eight points to 49 per cent, WHEELING-WEIRTON down 12 points to 74 per cent. PITTSBURGH is off only two points to 39 per cent and CHICAGO has lost four and a half points to 56 per cent.

The heavy losses in some districts are, however, not as bad as they appear as allowances have been made in the cases of certain mills that will shut down Friday or Saturday and remain idle until after the Christmas holiday. Some plants will be down longer than others, depending on the individual situation with respect to supplies of raw steel.

Finishing mill operations will not be materially affected except on the holiday.

PRICES

. . . Quotations firm on the major steel items

DESPITE the slackening in new business at the year end, mill prices on the major steel products continue firm. A test of prices on flat rolled steel was made recently at Detroit, where an automobile manufacturer bought at least 10,000 tons of body sheets, but there was no reported indication of price weakness.

Where price weakness exists it is in products that have been in that condition for some time, such as reinforcing bars, fabricated structural shapes, galvanized roofing, merchant wire products and merchant pipe (out of jobbers' stocks and principally in NEW YORK).

Contrary to an improved trend of prices on reinforcing bars in some districts, the New York market is still weak. On a recent job involving 200 tons a low price of 1.94c. a lb., delivered by truck, was quoted.

Farm equipment manufacturers have announced price reductions ranging from 4 to 10 per cent. The reductions, made mostly on light equipment, will apply to 1939 dealer contracts. Tractor prices were not changed, having been lowered some time ago.

NEW BUSINESS

. . . Year end slackening in new orders is more pronounced

IN all areas the year-end slackening in new orders for steel has become more pronounced within the past week. Some orders have been placed for immediate shiment and some for shipment after Jan. 1, but as the aggregate of all business is smaller than that which was being received in November, without much change apparently in the rate of consumption, the inference is clear that a good many buyers are waiting until after the first of the year, knowing that deliveries will be reasonably prompt. The only delays are on cold rolled sheets, which some mills cannot ship for four or five weeks or longer.

At PITTSBURGH the total of new business in the past week was no less than in the previous week, but business this month has been off from the November rate of buying. Major support in the leading center has come from automobile companies, structural steel fabricators and from miscellaneous users.

A similar situation exists at CLEVELAND and YOUNGSTOWN, where a period of comparative inactivity is expected to last until some time in January. Automobile manufacturers are expected to come into the market early next month, but the extent of their purchases will depend upon retail car sales in the interim.

In the CHICAGO area stocks of many types of steel in the hands of consumers are quite low, a fact which increases the hopes of steel makers that considerable improvement will come in the first quarter.

Manufacture of farm implements and farm tractors will continue slow until well into the first quarter

The second section of the CHICAGO subway will be bid Jan. 5 and will involve 2750 tons of reinforcing bars, 225 tons of shapes, over 3000 tons of liner plates and 109 tons of cast iron for drainage purposes.

In the SOUTH the business situation seems to be somewhat better than in other districts. Bookings continue to be satisfactory and inquiries are numerous. The Pullman Standard Car Mfg. Co. has released upward of 10,000 tons of steel for 1300 box cars to be built at its Bessemer, Ala., plant for the Southern Railway.

PIG IRON

. . . Shipments better than expected as year nears end

SHIPMENTS at most points are holding better than expected, with CLEVELAND producers finding December to date matching November and some CHICAGO sellers finding the first half of the current month 5 per cent ahead of the like November period. Automotive foundries in the North and stove plants in the South have been among the most active, while in the Mid-West agricultural machinery foundries are fairly well occupied.

The usual seasonal letdown is reported at PITTSBURGH, with a moderate upturn in new business expected after Jan. 1, while NEW YORK finds little business being done outside of occasional carlots for prompt delivery. There, too, shipments are holding equal to November's rate. ST. LOUIS shipments of pig iron continue at the highest point of the year. BIRMINGHAM shows 16 of 18 furnaces in blast, with the market unchanged, and CINCINNATI reports more aggressive ordering with one additional stack to be lighted after Christmas.

SEMI-FINISHED STEEL

. . . Orders holding at a fairly good rate

ALTHOUGH every effort is being made by consumers to hold purchases to a minimum because of inventory reasons, orders during the past week were actually in better vol-

ume than a week ago. Wire rod demand is holding at recent levels and the same may be said of skelp. Non-integrated flat rolled mills continue to furnish the major support in current demand.

IRON ORE

. . . Stocks on Dec. 1 totaled 37,456,325 tons

THE 3,000,000-ton mark for consumption of LAKE SUPERIOR iron ore was exceeded by blast furnaces during November for the first time this year. The latest report of the Lake Superior Iron Ore Association, CLEVELAND, shows 3,150,073 gross tons consumed in November compared with 2,780,585 tons in October and 2,734,504 tons in November, 1937. The number of furnaces using Lake ore active on Nov. 30 was 95 compared with 88 on the same date a month earlier. Ore on hand at furnaces Dec. 1 totaled 32,166,031 gross tons and at Lake Erie docks 5,290,294 tons, making a total of 37,456,325 gross tons. This compares with 42,625,954 on hand Dec. 1, 1937.

Market Sidelights

Increased operations between June and Dec. 1 in the plants of Republic Steel Corp. resulted in raising employment from approximately 37,000 to nearly 48,000, the company has announced. Operations in June were 21 per cent and at the beginning of December, 67 per cent. In addition to the increase of approximately 11,000 men on the employment roll, the average hours worked per week increased from 25 in June to 32.8 at the first of December.

* * *

Councilmen's insistence on cast iron pipe for Cincinnati's water system to aid employment in the local plant is largely responsible for an expansion in operation at the Addyston (near Cincinnati) foundry of U. S. Pipe & Foundry Co., expected after Jan. 1. The order, subject to WPA approval, amounts to $184,600 and requires pipe and castings totaling about 4000 tons.

* * *

The December payroll at the Gadsden plant of the Republic Steel Corp. is 55 per cent greater than in December, of last year. Tennessee Coal, Iron & Railroad Co. now has more than 20,000 on its rolls.

STRUCTURAL STEEL

. . . Large New York Courts building contract goes to Bethlehem

STRUCTURAL steel requirements of the Criminal Courts Building in NEW YORK, totaling 16,500 tons, have been awarded to Bethlehem Steel Co. and 3700 tons for the second section of the Delaware Aqueduct will be provided by Dravo Corp., Pittsburgh, with a third section of the latter project, calling for 3100 tons, out for bidding.

Those awards, made as producers attempt to measure first quarter prospects, particularly with regard to Government-sponsored work, were, with the 5000 - ton Milford - Stratford Bridge, Conn., and a 3800-ton contract for Navy Yard cranes (both going to American Bridge Co.) the largest of the week. Construction on PWA projects was supposed to start before Jan. 1 but in many cases this condition can be met by commencing work other than steel fabrication. In the SOUTHWEST, a contract involving 1900 tons for a paper mill at Lufkin, Texas, went to Mosher Steel Co., Dallas, Tex. Two thousand tons for Cape May, N. J., bridges went to the Bethlehem company.

New projects include 2500 tons for a NEW YORK apartment house, and 1000 tons for a Delhi, N. Y., school. The only large WEST COAST award of the week was 975 tons for two bridges for Southern Pacific railroad relocation around Shasta Dam. A heavy caisson gate for the Navy at Bremerton, Wash., will require 1500 tons. American Bridge received the contract for an Elmira, N. Y., bridge, calling for 600 tons. No large awards have been reported from the CHICAGO area. Seven hundred tons for the first section of the CHICAGO subway has not been awarded while the subway's second section will require only 225 tons. Bids opened Dec. 9 for Oklahoma highway bridges were returned and the projects postponed indefinitely.

TIN PLATE

. . . 1939 expected to be good year . . . orders slow now

TIN plate consumers appear to be marking time preparatory to placing early 1939 requirements. No rush of new business is expected much before the end of January or first part of February, 1939. Some specifications have been placed for shipment after the first of the year which is customary at this time. Producers look forward to an excellent production record for 1939. Meanwhile, operations continue to hold around 35 per cent.

During the past week a few large oil companies have placed moderate sized tonnages of tin plate for export. Domestic oil companies in some cases are now sending out inquiries for part of their first quarter 1939 tin plate requirements.

MERCHANT BARS

. . . Sales slow but pickup is expected in January

HOT rolled bar sales at PITTSBURGH leveled off slightly during the past week, the drop being attributable entirely to seasonal influences. Producers look for resumption in buying after the first of the year from automotive and miscellaneous sources.

CHICAGO district demand for merchant bars is moderate in view of the low operation of farm equipment makers, and a slowing in the rate with which motor car plants are buying.

Incoming specifications at CLEVELAND and YOUNGSTOWN have pulled up close to the November level, due to receipt of fair tonnages in the last few days. However, it is generally conceded December will wind up short of the previous month.

RAILROAD BUYING

. . . Pennsylvania buys 50,000 tons of rails . . . N & W orders 2100 cars

RAILROAD orders again take the limelight this week when business in other lines is inconspicuous.

The Pennsylvania Railroad has distributed orders for 50,000 tons of rails as follows: Carnegie-Illinois Steel Corp., 25,000 tons; Bethlehem Steel Co., 22,000 tons; Inland Steel Co., 3000 tons. These rails probably will be rolled soon after the first of the year.

The New York, New Haven & Hartford has applied to the United States District Court at New Haven for permission to buy 15,649 tons of rails with accessories at a total cost of about $1,000,000.

The Chicago Great Western has purchased 3500 tons of rails from Carnegie-Illinois and 700 tons from Inland and has divided about 2800 tons of accessories among several producers.

Chesapeake & Ohio is in the market

for tie plates and other fastenings to accompany its 25,000-ton rail order awarded last week.

In railroad equipment buying the outstanding orders are those of the Norfolk & Western for 2100 cars as follows: 750 hopper cars to Bethlehem Steel Co., 750 hopper cars to Virginia Bridge Co., Roanoke, Va. 500 box cars to Pressed Steel Car Co., Pittsburgh, and 100 box cars to Greenville Car Co., Greenville, Ga. The 1500 hopper cars will utilize about 17,500 tons of steel, while the 600 box cars will take approximately 6600 tons.

The Pullman Co. has ordered 80 cars from the Pullman Standard Mfg. Co. Forty of the cars will be put in service on the New York Central and 40 on the Pennsylvania.

The Wabash has received authorization from the court to equip 200 freight cars with automobile loading racks and to make general repairs on 100 of the cars.

The Chicago & North Western is seeking Federal approval for the streamlining of two "400" trains and the acquisition of diesel power for them at a total cost of $2,320,000.

The Fredericksburg & Northern is contemplating the purchase of one locomotive. The Frankford Arsenal, Philadelphia, is taking bids on one 50-ton flat car.

SHEETS AND STRIP

. . . Production still heavy but orders are lighter

MILLS at PITTSBURGH report scattered demand comprising fill-in requirements from automotive makers. Total bookings, however, have receded some in the past week. To some extent export business has been a factor in the current market. New automotive buying on a larger scale may not materialize much before the middle of January but from a production standpoint some mill will be exceptionally busy during the remainder of this year.

At CLEVELAND, December shipments of sheets and strip apparently will be slightly under the November volume. Although Ohio mills are making strenuous efforts to clear and deliver all orders booked during October and November, there will be a carry-over into January on considerable tonnage. Only fill-in orders have been received from the automobile industry recently, but it is understood these commanded full quoted prices.

Incoming business in CHICAGO is only moderate in volume. It now appears that large automobile tonnages will not be seen until after the first of the year. Refrigerator interest is light but stove plants are fairly active. Miscellaneous demand is holding up well. Farm equipment buying is not important, and galvanized sheets, as a consequence, are moving slowly.

There has been a fair amount of miscellaneous buying in the NEW YORK area in the past 10 days, indicating that not all requirements were anticipated during the time low-priced orders were placed. Much of this new material is for delivery within the next three weeks.

TUBULAR GOODS

. . . Orders light and 1939 outlook is uncertain

THERE has been little change at PITTSBURGH in the status of total tubular specifications. Oil-country goods consumers are marking time pending definite information on 1939 appropriations. Standard pipe continue to move freely from jobbers' stocks but replenishment is not at the same rate because of inventory taking factors.

CLEVELAND and YOUNGSTOWN producers report that their orders for tubular goods have been light this month. Drilling is well sustained in the ILLINOIS field but wells there are comparatively shallow. Except for a number of small connecting lines and a few large projects which are not yet out of the planning stage, the line pipe field is devoid of interest.

PLATES

. . . Railroad equipment buying chief hope for business

AN improvement in railroad equipment buying offers the chief hope for an early increase in tonnage for plate mills. Although shipbuilding work, both naval and merchant, is increasing, the plate requirements may not be ordered for some time.

Bids will be taken Jan. 5 on a second section of the Chicago subway, for which about 3200 tons of liner plates will be required. A like tonnage for the first section has not yet been awarded.

In the EAST the market is still dragging. Principal business of Eastern mills has consisted of plates for the Navy, some small tonnages for railroads and a few lots for tanks. The Norfolk & Western has bought an unstated tonnage of plates for its shops at Roanoke, Va.

WIRE PRODUCTS

. . . Manufacturers' shipments holding up fairly well

AT CLEVELAND shipments are better in December than expected, although the month will fall under October and November. Producers' stocks are below normal, which indicates operations will hold up during future weeks excepting for holiday interruptions. Prices of merchant wire products are spotty in a number of areas, although the Eastern Seaboard situation is much firmer than at any time during the past three months.

Merchant wire demand at PITTSBURGH has dropped off some in the past few weeks but a resumption of buying by jobbers is anticipated in January in order to prepare for spring requirements. Consumers' inventories at present are small. Orders for manufacturers' wire are holding up fairly well with automotive and miscellaneous support.

Los Angeles Department of Water and Power asks bids Dec. 27 on 2,800,000 ft. of ½-in. galvanized steel strand for overhead ground wire from Los Angeles to Boulder Dam.

Wire demand in CHICAGO is gradually slowing down as the year ends, all buyers striving to keep inventories as low as possible. One seller reports that stocks are very low in most consuming plants. Some buyers already are apprehensive over the prospects of a first quarter scramble and have sounded out mills. Rods are well booked at present and a large demand is anticipated soon after inventory periods. An upturn in merchant products is looked for in late spring.

BOLTS, NUTS, RIVETS

. . . Major support comes from automobile manufacturers

THE total volume of bolt and nut business at PITTSBURGH, although affected to some extent by seasonal factors, continues to hold up better than expected. Major support is coming from automotive specifications but producers are hopeful that the

flood of structural projects will soon be reflected on order books.

Very little change from last week has occurred at CLEVELAND. Incoming orders are sparse and not much activity is expected until the middle or latter part of January.

REINFORCING BARS

. . . *Brooklyn Meeker Avenue Bridge, Chicago Subway jobs let*

AN award of 3800 tons for the CHICAGO subway has been taken by Herlihy Mid-Continent Co., and 2500 tons for the Meeker Avenue bridge, Brooklyn, has gone to Igoe Brothers, Newark, N. J. Concrete bar business at PITTSBURGH is reported holding with producers flooded with inquiries involving Government-financed projects.

Interest in prospects for the first quarter in the main are centered on PWA jobs. Pending business includes 2600 tons for a storage building and 2750 tons for the second section of the subway at CHICAGO, 1486 tons for a quay wall at Mare Island, Cal., and 1120 tons for the Metropolitan Water District, Los Angeles. Mesh requirements of close to 1200 tons for four NEW YORK STATE highway projects have been placed, and school jobs in the BUFFALO area are likely to take fair tonnages before the year ends.

SHIPBUILDING

. . . *Bethlehem awarded three ships . . . Navy bids on cruisers Feb. 15*

APPROXIMATELY 3000 tons of steel will be required for each of the two 6000-ton cruisers for whose construction the Navy Department will open bids on Feb. 15.

Each of the three combination cargo-passenger ships, awarded to the Bethlehem Steel Co., by the Maritime Commission, will require 4370 tons of steel. The vessels are to be built for the Mississippi Shipping Co., New Orleans. The Bethlehem bid was $3,218,000 for each ship.

CAST IRON PIPE

Mena, Ark., closes bids Dec. 24 for pipe for water system and other waterworks installation. V. V. Long & Co., Colcord Building, Oklahoma City, Okla., are consulting engineers.

Fairplay, Mo., will take bids soon for pipe for water system and other waterworks installation. Cost about $32,000. Financing has been arranged through Federal aid. R. Sweeney, 663 Cherry Street, Springfield, Mo., is consulting engineer.

Des Moines, Iowa, is establishing new water district No. 4 in Bloomfield Township, and plans pipe lines and other waterworks facilities. An election will be called soon to approve project.

Augusta, Wis., plans pipe line extensions and replacements in water system. Fund of about $50,000 is being arranged for this and improvements in sewerage system, work to be carried out in spring. Frank J. Davy & Son, 502 Main Street, LaCrosse, Wis., are consulting engineers.

Covington, La., plans pipe line extensions in water system. Fund of $24,630 has been secured through Federal aid and further financing will be arranged.

Bryan, Tex., closes bids Dec. 27 for pipe line extensions in water system; also for pumping machinery and other waterworks equipment, new wells and reservoirs. Cost about $445,000, of which $200,000 is a Federal grant. R. G. Williams, City National Bank Building, is engineer.

Lincoln, Neb., plans pipe line extensions in water system, including new trunk main in section of Huntington Avenue; also improvements in waterworks station, with installation of pumping machinery and auxiliary equipment. Fund of $60,000 has been arranged through Federal aid.

Wenham, Mass., plans about five miles of pipe lines, various sizes, for extensions in water system; also new 500,000-gal. steel standpipe. Cost about $60,000. Whitman & Howard, 89 Broad Street, Boston, are consulting engineers.

New Boston, Ohio, plans extensions in water pipe lines and other waterworks installation. Cost about $272,700, of which $122,700 will be a Federal grant. Burgess & Niple, 568 East Broad Street, Columbus, Ohio, are consulting engineers.

Macon, Miss., closes bids Dec. 27 for pipe for extensions in water system and other waterworks installation. Krouse & Brasfield, Meridian, Miss., are engineers.

Pensacola, Fla., has let contract to American Cast Iron Pipe Co., at $56,865, for pipe for extensions in water system.

Fresh Water District of Stewart Heights, Houston, Tex., recently organized by Nolan Cloud and I. N. Jones, Stewart Heights, and associates, plans pipe lines for water system in area noted. Cost about $60,000. Financing will be arranged soon.

Castle Hill (Waterloo P. O.), Iowa, plans about 12,000 ft., various sizes, for water system, including trunk main from Cedar Falls. Bond issue is being arranged for work. R. B. Slippy Engineering Co., Lafayette Building, Waterloo, is consulting engineer.

Seattle, Wash., water system extension will include 220 tons of 4, 6 and 8-in. pipe purchased from United States Pipe & Foundry Co., San Francisco, by contractor.

Eugene, Ore., has awarded 120 tons of pipe to United States Pipe & Foundry Co., San Francisco.

Moab, Utah, has awarded pipe for waterworks improvement to Pacific States Cast Iron Pipe Co., Provo, Utah, at $15,094.

. . . CANADA . . .

. . . *Year-end lull is felt in Dominion.*

TORONTO, Dec. 20.—The year-end holiday season tends to slow down contract placing. While large orders are expected from the railroads, none has yet been announced. British war and airplane contracts are in the offing and are expected to be announced early in the new year. Domestic demand for iron and steel is steady, but lacking in special feature. Inquiries are beginning to appear for first quarter delivery.

British Minerals Booklet

THE 1935-37 edition of the Imperial Institute's "Statistical Summary of the Mineral Industry of the British Empire and Foreign Countries has recently been issued. Copies may be obtained from the Imperial Institute, South Kensington, London, S. W. 7., price 7/6d (8/— post free).

Weekly Bookings of Construction Steel

	Week Ended				Year to Date	
	Dec. 20, 1938	Dec. 13, 1938	Nov. 22, 1938	Dec. 21, 1937	1938	1937
Fabricated structural steel awards	49,700	13,250	16,000	12,100	922,620	848,735
Fabricated plate awards	1,250	610	1,140	2,115	130,100	132,570
Steel sheet piling awards	1,000	2,025	890	0	49,985	59,130
Reinforcing bar awards	8,925	8,000	3,200	1,700	331,075	268,380
Total Letting of Construction Steel..	60,875	23,885	21,230	15,915	1,433,780	1,308,815

FABRICATED STEEL

NORTH ATLANTIC STATES

Awards

16,500 Tons, New York, Criminal Courts building, to Bethlehem Steel Co., Bethlehem, Pa.

5000 Tons, Milford-Stratford, Conn., bridge, to American Bridge Co., Pittsburgh.

3700 Tons, Fishkill, N. Y., Delaware Aqueduct, to Dravo Contracting Co., Pittsburgh.

3200 Tons, New York and Norfolk, Va., hammer cranes for navy yards, to American Bridge Co., Pittsburgh.

2075 Tons, New York, five apartment buildings, 215th Street and Park Terrace, to Schacht Steel Construction Co., New York.

2000 Tons, Cape May, N. J., bridges, to Bethlehem Steel Co., Bethlehem, Pa.

1200 Tons, case structures, various locations, Socony Vacuum Oil Co., to Bethlehem Steel Co., Bethlehem, Pa.

1000 Tons, Washington, ordnance storehouse building, to Barber & Ross, Washington.

915 Tons, Baltimore, 12 buildings for Gulf Oil Corp., to United States Steel Products Co., Pittsburgh.

680 Tons, New York, apartment building, Park Avenue and 35th Street, to Harris Structural Steel Co., Plainfield, N. J.

600 Tons, New York, apartment building, Wallenstein Construction Co., to Ingalls Iron Works Co., Birmingham.

600 Tons, Elmira, N. Y., bridge, to American Bridge Co., Pittsburgh.

504 Tons, Hagerstown, Md., city hall, to Bethlehem Fabricators, Inc., Bethlehem, Pa.

475 Tons, Newton, Conn., hospital building, to Bethlehem Fabricators, Inc., Bethlehem, Pa.

400 Tons, New York, dispensary building, 80th Street and East End Avenue, to Harris Structural Steel Co., Plainfield, N. J.

300 Tons, Barkhamstead, Conn., Farmington River bridge, to Pittsburgh-Des Moines Steel Co., Pittsburgh.

300 Tons, Auburn, N. Y., Commercial Junior-Senior High School, to Leach Steel Corp., Rochester, N. Y.

265 Tons, Pittsburgh, Thaddeus Stevens School, to Bethlehem Steel Co., Bethlehem, Pa.

210 Tons, Bangor, Me., police station and garage, to American Bridge Co., Pittsburgh.

174 Tons, Abington, Mass., two schools, to an unnamed fabricator; Carilli Construction Co., Boston, contractor.

170 Tons, Mineola, N. Y., grade schools, to Reiche & Penner, Brooklyn.

150 Tons, Homestead, Pa., Senior High School to American Bridge Co., Pittsburgh.

140 Tons, Boston, garage for L. C. Cyr, to New England Structural Co., Everett, Mass.

115 Tons, Pittsburgh, alterations to West View High School, to Levinson Steel Co., Pittsburgh.

115 Tons, Buxton, Me., Bonny Eagle bridge over Saco River, to American Bridge Co., Pittsburgh.

110 Tons, Camden, N. J., school, to American Iron Works, Camden.

THE SOUTH

1900 Tons, Lufkin, Tex., Southland Paper Mills, Inc., buildings, to Mosher Steel Co., Dallas, Tex.

730 Tons, Charleston, W. Va., bridge, to Mount Vernon Bridge Co., Mount Vernon, Ohio.

350 Tons, Santa Rosa County, Fla., bridges, to Virginia Bridge Co., Roanoke, Va.

195 Tons Kanawha, W. Va. bridge to American Bridge Co., Pittsburgh.

170 Tons, Nashville, Tenn., hangar, to Johnson City Foundry & Machine Co., Johnson City, Tenn.

130 Tons, Hardin County, Tex., bridge, to Mosher Steel Co., Dallas, Tex.

120 Tons, Grafton, W. Va., overhead bridge, to American Bridge Co., Pittsburgh.

115 Tons, Fort Knox, Ky., officers' quarters, to Midwest Ornamental Iron Works.

CENTRAL STATES

495 Tons, Cincinnati, municipal garage, to L. Schreiber & Sons Co., Cincinnati.

415 Tons, Detroit, grade separation, to Wisconsin Bridge & Iron Co., Milwaukee.

370 Tons, Youngstown, Isaly Dairy Co., expansion, to Ohio Structural Steel Co., Newton Falls, Ohio.

320 Tons, Indianapolis, bridge repairs, to Central States Bridge & Structural Co., Indianapolis.

265 Tons, Dundy County, Neb., bridge to American Bridge Co., Pittsburgh.

240 Tons, Cleveland, Garfield Heights High School, to Mooney Iron Works, Cleveland.

240 Tons, Dundy County, Neb., 400 ft. beam bridge, to St. Joseph Structural Steel Co., St. Joseph, Mo.

240 Tons, Alliance, Neb., power house, to Haven Structural Steel Co., Kansas City, Mo.

220 Tons, Middletown, Ohio, bar mill extension for American Rolling Mill Co., to International Steel Co., Evansville, Ind.

183 Tons, Akron, Ohio, East Market Street grade elimination, to Burger Iron Works, Akron through Shulo Construction Co.

160 Tons, Detroit, addition to Diesel engine division, General Motors Corp., to R. C. Mahon Co., Detroit.

160 Tons, Dundy County, Neb., viaduct, to Omaha Steel Works, Omaha, Neb.

140 Tons, Bloomington, Ind., business administration building, State University, to Insley Mfg. Co., Indianapolis.

140 Tons, Ida Grove, Iowa, bridge, to Pittsburgh-Des Moines Steel Co., Pittsburgh.

120 Tons, Duluth, Minn., tower and bleachers, to American Bridge Co., Pittsburgh.

120 Tons, Bucklin, Kan., bridges, to American Bridge Co., Pittsburgh.

WESTERN STATES

975 Tons, Delta, Cal., third and fourth crossing bridges, Central Valley project, to American Bridge Co., Pittsburgh.

150 Tons, Green Mountain Dam and Estes Park, Colo., warehouses, Department of Interior, to Wisconsin Bridge & Iron Co., Milwaukee.

136 Tons, Winnemucca, Nev., Rose Creek overpass, to Bethlehem Steel Co., San Francisco; through Frederickson & Westbrook, Sacramento, Cal., contractor.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

4500 Tons, Putnam County, N. Y., Delaware Aqueduct, contract No. 321; bids in.

2590 Tons, New York, David Rose apartment houses.

1000 Tons, Delhi, N. Y., school building.

700 Tons, Pittsburgh, South Vocational School.

600 Tons, Gloucester, Mass., high school building.

550 Tons, Nassau County, N. Y., health center; bids in.

480 Tons, Butler, Pa., State bridge.

417 Tons, Mercer County, N. J., court house.

375 Tons, Middletown, Conn., hospital buildings.

350 Tons, Coxsackie, N. Y., cell block building.

350 Tons, Frederick, Md., high school.

300 Tons, Margaretville, N. Y., grade and high school.

275 Tons, Glen, N. Y., State bridge.

265 Tons, Stamford, N. Y., State highway bridge RC-4010.

265 Tons, Baltimore, Catholic High School Sisters Third Quarter.

200 Tons, Cambridge, Mass., Webster School.

170 Tons, Lawrence, Mass., two bridges, Hampshire and Short Streets.

150 Tons, Baltimore, nurses home, auditorium, etc., Home for Incurables.

115 Tons, Roxbury, N. Y., school building.

THE SOUTH

743 Tons, Sheffield, Ala., furnace, electro-Metallurgical Corp.

214 Tons, Corinth, Miss., bridge.

125 Tons, W. Union, W. Va., State bridge No. 1530.

115 Tons, South Louisville, Ky., round house roof alterations, Louisville & Nashville Railroad.

100 Tons, Troy, W. Va., State bridge No. 1534.

CENTRAL STATES

1600 Tons, Miami, Mo., bridge over Missouri River; Massman Construction Co., Kansas City, Mo., low bidder on general contract (previously reported).

668 Tons, Kansas City, Mo., Minnesota Avenue viaduct.

450 Tons, Chicago, hangar building and headquarters for Armory Board; bids Dec. 28.

319 Tons, Morton County, Kan., highway bridge.

240 Tons, Sandusky, Ohio, filtration plant, National Construction Co., Cleveland, general contractor (tonnage previously reported).

225 Tons, Chicago, section S-7 of subway; bids Jan. 5.

180 Tons, Wichita, Kan., highway bridge.

150 Tons, Houghton, Mich., Michigan College dormitory.

150 Tons, Aitkin, Minn., high school addition.

140 Tons, Athens, Ohio, school building; bids in.

125 Tons, Cleveland, W-9 W-6 approach, Main Avenue bridge.

WESTERN STATES

1200 Tons, Bremerton, Wash., caisson gate for Navy Yard.

354 Tons, Denver, highway work on State highway 83; bids Dec. 29.

275 Tons, Salt Lake City, Utah, field house, Utah University.

260 Tons, Shelley, Idaho, State bridge.

230 Tons, Twin Falls, Idaho, State bridge.

225 Tons, Shelley, Idaho, bridge.

187 Tons, Grand Coulee, Dam, Wash., pier noses for power plant; bids Jan. 4.

121 Tons, Calexico, Cal., including 44 tons cast iron, gates and hoists; Pacific Iron & Steel Co., Los Angeles, low bidder.

118 Tons, Ritzville, Wash., undercrossing; bids Jan. 4.

Unstated tonnage, Boise, Idaho, 546-ft. steel and timber bridge.

Unstated tonnage, Granby, Colo., warehouse (Invitation 1160-D); bids Dec. 30.

FABRICATED PLATES

AWARDS

510 Tons, Pittsburgh, Squirrel Hill water tank, to Hunter Steel Co., Pittsburgh.

340 Tons, Crownover, Wash., roller gates, Roza Diversion Dam, to Bartlett Hayward Co., Baltimore.

300 Tons, Stamford, Conn., two tanks for Stamford Gas & Electric Co., to Chicago Bridge & Iron Co., Chicago.

100 Tons, Lawrence, Mass., two water tanks, to Pittsburgh-Des Moines Steel Co., Pittsburgh.

PENDING PROJECTS

500 Tons, Tacoma, Wash., 24, 36, and 42-in. pipe; bids Dec. 29.

500 Tons, Corbett, Wyo., Buck Springs Creek siphon; bids in.

150 Tons, Kremmling, Colo., tunnel liners, Green Mountain Dam.

100 Tons, Richmond, Cal., water tank; bids Dec. 28.

SHEET PILING

AWARDS

1000 Tons, Cleveland, lakefront development, to Bethlehem Steel Co., Bethlehem, Pa.

PENDING PROJECTS

3100 Tons, Putnam County, N. Y., Delaware Aqueduct, contract No. 321; bids in.

132 Tons, Lawrence County, Ohio, State highway projects; bids in.

. . . NON-FERROUS . . .

. . . Heavy buying boosts lead $2 a ton . . . Tin moderately active . . . Copper and zinc dull.

PROSPECTS of an improvement hovered momentarily over the non-ferrous market in the past week, as the upward trend of stock prices brought out a short burst of activity on Thursday. On that day bookings by the foreign cartel jumped to 4000 tons, the foreign price moved up to 10.47c. and better domestic inquiry was in evidence. However, the reversal of the trend of stock prices on the following day brought a rapid change in sentiment and foreign sales dropped back to 900 tons, the export quotation retreated to 10.42c., domestic interest disappeared, and the market again resumed its featureless sidewise movement. Domestic producers' prices continue unchanged at 11.25c. per lb., Connecticut Valley, but outside offerings at around 10.50c. per lb. are fairly numerous.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Dec. 14	Dec. 15	Dec. 16	Dec. 17	Dec. 19	Dec. 20
Copper, Electrolytic[1]	11.25	11.25	11.25	11.25	11.25	11.25
Copper, Lake	11.375	11.375	11.375	11.375	11.375	11.375
Tin, Straits, New York	46.00	46.35	46.00	...	46.00	46.00
Zinc, East St. Louis[2]	4.50	4.50	4.50	4.50	4.50	4.50
Lead, St. Louis[3]	4.60	4.60	4.60	4.60	4.70	4.70

[1] Delivered Conn. Valley, deduct ¼c. for New York delivery. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Prices

Base per lb., Delivered

	New York	Cleveland
Tin, Straits pig	47.00c.	49.75c.
Copper, lake	12.25c.	12.375c.
Copper, electro	11.50c.	12.375c.
Copper, castings	11.25c.	11.875c.
*Copper sheets, hot-rolled	19.375c.	19.375c.
*High brass sheets	17.31c.	17.31c.
*Seamless brass tubes	20.06c.	20.06c.
*Seamless copper tubes	19.875c.	19.875c.
*Brass rods	12.62c.	12.62c.
Zinc slabs	6.25c.	7.25c.
Zinc sheets, No. 9 casks	10.50c.	12.10c.
Lead, American pig	5.60c.	5.60c.
Lead, bar	6.275c.	8.50c.
Lead, sheets, cut	8.00c.	8.00c.
Antimony, Asiatic	15.00c.	17.75c.
Alum., virgin, 99 per cent plus	22.50c.	22.50c.
Alum., No. 1 remelt., 98 to 99 per cent	19.50c.	19.50c.
Solder, ½ and ½	28.55c.	29.10c.
Babbitt metal, commercial grade	22.75c.	22.50c.

* These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33 1/3; on brass sheets and rods, 40, and on brass and copper tubes, 25.

Old Metals Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	8.00c.	8.75c.
Copper, hvy. and wire	7.00c.	7.50c.
Copper, light and bottoms	6.25c.	6.50c.
Brass, heavy	4.25c.	4.75c.
Brass, light	3.375c.	4.125c.
Hvy. machine composition	6.125c.	7.625c.
No. 1 yel. brass turnings	4.125c.	4.625c.
No. 1 red brass or compos. turnings	5.875c.	6.50c.
Lead, heavy	3.625c.	4.50c.
Cast aluminum	7.00c.	8.25c.
Sheet aluminum	11.75c.	13.25c.
Zinc	2.25c.	3.50c.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered; virgin 99 per cent plus, 20c.-21c. a lb.; No. 12 remelt, No. 2 standard, 19c.-19.50c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt, New York; Asiatic, 14c. a lb., f.o.b.; American, 11.25c. a lb. QUICKSILVER, $77 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 11c. a lb. lcl.

Lead

Following several very dull weeks, sales in the week past spurted to nearly 12,000 tons. The sudden change in buying sentiment, which synchronized with the improvement in prices on the stock exchange, resulted in a demand far in excess of sellers' daily intakes and large day-to-day carryovers resulted. On Monday producers raised their prices to 4.70c. per lb., St. Louis, a price still $2 a ton below the price prevailing during the first week of the month. The price rise had no effect on sales, as the demand on Monday and Tuesday indicated another week of good bookings. The bulk of the week's business was for January, which at present is about 35 per cent covered.

Zinc

Sales in the past week slumped to 1896 tons from 3280 in the previous week, but shipments, at 3500 tons, showed a slight improvement over the preceding week's total of 3268 tons. The market has still not completely regained its equilibrium since the drastic price reductions put into effect a few weeks ago. Buyers are still very cautious in making commitments, despite the general low level of consumers' reserves, and the foreign price seems unable to leave the range of 2.80c. to 2.85c. The domestic spelter price is unchanged at 4.50c. per lb., East St. Louis.

Tin

The market was moderately active in the past week. Prices moved in very narrow limits, with spot straits holding close to 46c. per lb., New York, all week. Part of the present price firmness in face of the small demand is due to the reluctance of brokers to sell while replacement costs at Singapore are above the domestic level. Tuesday's eastern price was £221 15s., while cash standards at London were priced at £213 15s., and three months metal at £215.

. . . OBITUARY . . .

VERNON M. BROWN, secretary-treasurer of the Sloss-Sheffield Steel & Iron Co., Birmingham, died Dec. 8. He had been with the company for more than 11 years.

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RALPH C. VELTE, aged 55, vice-president of the Valley Mould & Iron Corp., Hubbard, Ohio, died at Youngstown on Dec. 20. Mr. Velte had been with the company for the past 20 years.

IRON AND STEEL SCRAP

. . . Year-end lull settles on scrap market and not much change in prices is expected until after Jan. 1 . . . Composite unchanged at $14.92.

DEC. 20.—No. 1 steel is unchanged in price in the principal markets and the composite remains at $14.92. Very little activity is expected in any buying center until after the first of the year. Because of the willingness of dealers to sell at lower prices at Buffalo, where mills are still holding up shipments, quoted figures on leading grades are off 25c. there. Some items at Chicago have been similarly affected. However, most prices are nominal in the absence of mill purchases, except at Pittsburgh, where sales are still being made into consumption at $16 or better for No. 1 steel.

The only strength being exhibited is in export buying prices. Following the lead taken at Philadelphia last week, New York prices are slightly stronger and dealers at Boston are paying more for desirable tonnages. Japan is expected to come into the market again before the end of the month.

Pittsburgh

The market continues to mark time with no change in quotations. The majority of No. 1 steel purchases in this district are being closed at $16 a ton or better, delivered. A clarification of trend is expected after the first of the year.

Chicago

No mill activity has been reported here recently, and none is looked for soon, although expectation of higher operations after the first of the year, and consequent higher prices, may cause some buying. Heavy melting steel is unchanged at $13.50 to $14.

Youngstown

Additional embargoes on shipments went into effect on Monday of this week, depriving the market of most of the little remaining activity. The hold-ups from all indications will remain in force until after the holidays, as open-hearth activity will be light, as usual.

Cleveland

There is very little activity here as the holiday season approaches. Prices are purely nominal and from all appearances will remain so until January at least. Vessel shipments from Detroit continued well into December but are practically completed now.

Buffalo

Although mills are still holding up shipments and no sales have been reported this week the market is softer with some dealers willing to sell at slightly lower prices. The decrease places No. 1 heavy melting steel at $13.75 to $14.25 with the customary differentia in No. 2 material and other allied grades. At the same time, movements of cast scrap are slowing up.

St. Louis

Because of sales of the preceding week and the prospect of an East Side mill coming into the market this week, the scrap iron market in St. Louis is stronger. No. 2 heavy melting and No. 1 railroad cast are 25c. a ton higher, and miscellaneous standard section rails are up 50c. a ton. Railroad lists: Chicago, Rock Island & Pacific, 4497 tons; Chicago, Milwaukee, St. Paul & Pacific, 2000 tons.

Cincinnati

The market undertone strengthened during the past week under anticipated New Year improvement. Some steel and clippings were ordered by one district interest, but the amounts were not great. Dealers bids are unchanged, however, and lists are still nominal.

Detroit

Approach of the year's end found Detroit scrap prices generally drifting sideways with indications of weakness. Short shovel turnings were down on several plant sales. Lists during the week between the holidays will wind up 1938 activity probably with lower prices, it is anticipated.

Boston

The export market continues active and strong. The top price paid by shippers the past week for No. 1 steel was $14 a ton delivered dock, an advance of 25c. a ton. The trade admits it will pay better than $14 a ton for selected stock, and a sale actually was made last Saturday at $14.20 a ton for round tonnge. The scrap involved at that price was an estimated 750 tons of rails, plates, spikes and other railroad material sold by a Hull, Mass., dealer, who purchased the material from the Old Colony Railroad. Last week a boat with 5175 tons of steel and bundles, and another with 4204 tons left here for Italy, a total of 9379 tons. With mill operations in Pennsylvania easing off, as is usual at this time of year, domestic consumers evince little interest in scrap, and New England buying of machinery cast has been very light of late.

New York

Seasonal inactivity is apparent in the present market, with only an occasional flurry to meet a particular boat schedule for export. Domestic shipments are at low ebb. The bid of $80,000 by the Portland Mill Wrecking Co. for tearing down the Sixth Avenue "L" was thrown out by the Board of Estimate on Monday because of default, and instead the contract was awarded to the Harris Structural Steel Co., which is carrying out a number of structural projects for the city, including construction of uncompleted sections of the West Side elevated highway. Harris' bid was $40,000. Other bidders on Dec. 5 had asked the city to pay up to $150,000 to demolish the 60-year old line. About 17,000 tons of structural iron and 2800 tons of rails are involved, the disposition of which has not definitely been announced.

Export buying prices are somewhat stronger in the face of expected new commitments from the Orient and Europe.

Philadelphia

One export boat will finish loading a cargo for Japan today, and an Italian cargo will clear before the week's end. Excepting this preparation of scrap for Port Richmond, however, the trade here is suffering from year-end inactivity, as most mills are disinclined to add to their current slim inventory position. Prices are untested on many products, and the entire list will doubtless mark time until early January, at which time the steel operating rate and influence of additional export sales will be more clearly discernible.

Public Contracts Board Wage Minimum Cut 10¢

WASHINGTON.—The Secretary of Labor has issued an order fixing a minimum wage for employees in the aircrfat manufacturing industry of 50c an hr.—10c an hr. less than the rate recommended by the Public Contracts Board on June 24.

. . . OBITUARY . . .

CHARLES S. RYE, assistant manager of market research department, U. S. Steel Corp. of Delaware, Pittsburgh, was drowned Dec. 15 while vacationing in Florida. He was 37 years old. Mr. Rye was graduatel from Northwestern University in 1925. In August, 1927, he was employed by the Universal Atlas Cement Co. and in September, 1932, went with the U. S. Steel Corp. as the assistant manager of the market research department.

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CARLETON S. KOCH, president of Fort Pitt Steel Casting Co., McKeesport, Pa., died Dec. 18 at his home in Edgewood, Pa. Mr. Koch, a graduate of the Massachusetts Institute of Technology, was one of the founders of the Fort Pitt Steel Casting Co. and was an active member of the Steel Founders' Society of America and the American Foundrymen's Association. He was 62 years old.

Iron and Steel Scrap Prices

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$15.50 to $16.00
Railroad hvy. mltng.	16.00 to 16.50
No. 2 hvy. mltng. steel	14.25 to 14.75
Scrap rails	16.50 to 17.00
Rails 3 ft. and under	17.00 to 17.50
Comp. sheet steel	15.50 to 16.00
Hand bundled sheets	14.50 to 15.00
Hvy. steel axle turn.	14.00 to 14.50
Machine shop turn.	9.75 to 10.25
Short shov. turn.	10.50 to 11.00
Mixed bor. & turn.	8.25 to 8.75
Cast iron borings	8.25 to 8.75
Cast iron carwheels	15.00 to 15.50
Hvy. breakable cast	12.50 to 13.00
No. 1 cupola cast	15.25 to 15.75
RR. knuckles & cplrs.	16.50 to 17.00
Rail coil & leaf springs	16.50 to 17.00
Rolled steel wheels	16.50 to 17.00
Low phos. billet crops	17.50 to 18.00
Low phos. punchings	16.50 to 17.00
Low phos. plate	16.50 to 17.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$15.00 to $15.50
No. 2 hvy. mltng. steel	.... 13.50
Hydraulic bund., new	14.50 to 15.00
Hydraulic bund., old	11.50 to 12.00
Steel rails for rolling	17.00 to 17.50
Cast iron carwheels	16.50 to 17.00
Hvy. breakable cast	.... 16.00
No. 1 cast	16.50 to 17.00
Stove plate (steel wks.)	13.00 to 13.50
Railroad malleable	15.50 to 16.00
Machine shop turn.	8.50 to 9.00
No. 1 blast furnace	6.50 to 7.00
Cast borings	6.50 to 7.00
Heavy axle turnings	10.00 to 10.50
No. 1 low phos. hvy.	16.50 to 17.00
Couplers & knuckles	16.50 to 17.00
Rolled steel wheels	16.50 to 17.00
Steel axles	21.50 to 22.00
Shafting	20.00 to 20.50
Spec. iron & steel pipe	12.00 to 12.50
No. 1 forge fire	11.00 to 11.50
Cast borings (chem.)	9.50 to 10.00

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton
Hvy. mltng. steel	$13.50 to $14.00
Auto. hvy. mltng. steel alloy free	12.00 to 12.50
No. 2 auto. steel	11.50 to 12.00
Shoveling steel	13.50 to 14.00
Factory bundles	12.75 to 13.25
Dealers' bundles	12.00 to 12.50
Drop forge flashings	11.50 to 12.00
No. 1 busheling	12.00 to 12.50
No. 2 busheling, old	5.75 to 6.25
Rolled carwheels	15.25 to 15.75
Railroad tires, cut	16.25 to 16.75
Railroad leaf springs	15.75 to 16.25
Steel coup. & knuckles	15.25 to 15.75
Axle turnings	12.75 to 13.25
Coil springs	16.75 to 17.25
Axle turn. (elec.)	13.75 to 14.25
Low phos. punchings	15.75 to 16.25
Low phos. plates 12 in. and under	15.25 to 15.75
Cast iron borings	5.25 to 5.75
Short shov. turn.	7.00 to 7.50
Machine shop turn.	7.00 to 7.50
Rerolling rails	17.00 to 15.70
Steel rails under 3 ft.	15.75 to 16.25
Steel rails under 2 ft.	16.25 to 16.75
Angle bars, steel	15.25 to 15.75
Cast iron carwheels	12.25 to 12.75
Railroad malleable	14.75 to 15.25
Agric. malleable	11.25 to 11.75
	Per Net Ton
Iron car axles	19.50 to 20.00
Steel car axes	19.00 to 19.50
Locomotive tires	15.25 to 15.75
Pipes and flues	9.25 to 9.75
No. 1 machinery cast	12.25 to 12.75
Clean auto. cast	12.25 to 12.75
No. 1 railroad cast	11.25 to 11.75
No. 1 agric. cast	10.75 to 11.25
Stove plate	8.25 to 8.75
Grate bars	8.25 to 8.75
Brake shoes	9.25 to 9.75

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$15.00 to $15.50
No. 2 hvy. mltng. steel	13.75 to 14.25
Low phos. plate	15.50 to 16.00
No. 1 busheling	13.50 to 14.00
Hydraulic bundles	14.25 to 14.75
Machine shop turn.	9.75 to 10.25

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$14.00 to $14.50
No. 2 hvy. mltng. steel	13.50 to 14.00
Comp. sheet steel	13.50 to 14.00
Light bund. stampings	11.00 to 11.50
Drop forge flashings	13.00 to 13.50
Machine shop turn.	7.00 to 7.50
Short shov. turn.	7.50 to 8.00
No. 1 busheling	13.00 to 13.50
Steel axle turnings	11.00 to 11.50
Low phos. billet and bloom crops	18.00 to 18.50
Cast iron borings	7.75 to 8.25
Mixed bor. & turn.	7.75 to 8.25
No. 2 busheling	7.75 to 8.25
No. 1 cast	16.50 to 17.00
Railroad grate bars	9.50 to 10.00
Stove plate	10.00 to 10.50
Rails under 3 ft.	19.00 to 19.50
Rails for rolling	17.00 to 17.50
Railroad malleable	15.50 to 16.00
Cast iron carwheels	14.00 to 14.50

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$13.75 to $14.75
No. 2 hvy. mltng. steel	11.75 to 12.25
Scrap rails	15.00 to 15.50
New hvy. b'ndled sheets	11.75 to 12.25
Old hydraul. bundles	10.75 to 11.25
Drop forge flashings	11.75 to 12.25
No. 1 busheling	11.75 to 12.25
Hvy. axle turnings	10.50 to 11.00
Machine shop turn.	6.75 to 7.25
Knuckles & couplers	16.50 to 17.00
Coil & leaf springs	16.50 to 17.00
Rolled steel wheels	16.00 to 16.50
Low phos. billet crops	15.50 to 16.00
Shov. turnings	8.75 to 9.25
Mixed bor. & turn.	7.50 to 8.00
Cast iron borings	7.50 to 8.00
Steel car axles	16.50 to 17.00
No. 1 machinery cast	15.50 to 16.00
No. 1 cupola cast	14.50 to 15.00
Stove plate	13.00 to 13.50
Steel rails under 3 ft.	18.00 to 18.50
Cast iron carwheels	13.50 to 14.00
Railroad malleable	15.00 to 15.50
Chemical borings	9.00 to 9.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting	$13.00 to $13.50
No. 1 hvy. melting	13.00 to 13.50
No. 2 hvy. melting	12.00 to 12.50
No. 1 locomotive tires	13.00 to 13.50
Misc. stand. sec. rails	14.00 to 14.50
Railroad springs	15.50 to 16.00
Bundled sheets	8.00 to 8.50
No. 1 busheling	7.50 to 8.00
Cast. bor. & turn.	4.00 to 4.50
Machine shop turn.	4.50 to 5.00
Heavy turnings	9.50 to 10.00
Rails for rolling	17.00 to 17.50
Steel car axles	19.00 to 19.50
No. 1 RR. wrought	10.50 to 11.00
No. 2 RR. wrought	12.75 to 13.25
Steel rails under 3 ft.	15.50 to 16.00
Steel angle bars	14.50 to 15.00
Cast iron carwheels	14.00 to 14.50
No. 1 machinery cast	14.50 to 15.00
Railroad malleable	12.00 to 12.50
No. 1 railroad cast	12.75 to 13.00
Stove plate	9.00 to 9.50
Grate bars	8.50 to 9.00
Brake shoes	10.00 to 10.50

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel	$11.50 to $12.00
No. 2 hvy. mltng. steel	9.25 to 9.75
Scrap rails for mltng.	15.25 to 15.75
Loose sheet clippings	6.75 to 7.25
Hydrau. b'ndled sheets	11.00 to 11.50
Cast iron borings	4.00 to 4.50
Machine shop turn.	5.25 to 5.75
No. 1 busheling	8.00 to 8.50
No. 2 busheling	2.75 to 3.25
Rails for rolling	17.50 to 18.00
No. 1 locomotive tires	14.25 to 14.75
Short rails	18.00 to 18.50
Cast iron carwheels	12.75 to 13.25
No. 1 machinery cast	13.50 to 14.00
No. 1 railroad cast	12.75 to 13.25
Burnt cast	6.75 to 7.25
Stove plate	6.75 to 7.25
Agricul. malleable	11.75 to 12.25
Railroad malleable	14.25 to 14.75
Mixed hvy. cast	10.50 to 11.00

BIRMINGHAM

Per gross ton delivered to consumer:

Hvy. melting steel	$12.50 to $14.00
Scrap steel rails	14.50 to 15.00
Short shov. turnings	7.50 to 8.10
Stove plate	9.00 to 10.00
Steel axles	15.00 to 16.00
Iron axles	15.00 to 16.00
No. 1 RR. wrought	.... 10.00
Rails for rolling	16.00 to 16.50
No. 1 cast	.... 14.50
Tramcar wheels	.... 14.00

DETROIT

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. industrial steel	$10.50 to $11.00
No. 2 hvy. mltng. steel	9.00 to 9.50
Borings and turnings	5.75 to 6.25
Long turnings	5.50 to 6.00
Short shov. turnings	6.00 to 6.50
No. 1 machinery cast	12.25 to 12.75
Automotive cast	13.50 to 14.00
Hvy. breakable cast	9.75 to 10.25
Hydraul. comp. sheets	11.75 to 12.25
Stove plate	8.00 to 8.50
New factory bushel	10.75 to 11.25
Sheet clippings	8.25 to 9.25
Flashings	9.00 to 9.50
Low phos. plate scrap	12.00 to 12.50

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel	$10.50 to $11.00
No. 2 hvy. mltng. steel	9.00 to 9.50
Hvy. breakable cast	12.00 to 12.50
No. 1 machinery cast	11.50 to 12.00
No. 2 cast	9.50 to 10.00
Stove plate	9.50 to 10.00
Steel car axles	20.00 to 20.50
Shafting	15.50 to 16.00
No. 1 RR. wrought	11.00 to 11.50
No. 1 wrought long	9.50 to 10.00
Spec. iron & steel pipe	9.00 to 9.50
Rails for rolling	16.00 to 16.50
Clean steel turnings*	4.00 to 4.50
Cast borings*	3.50 to 4.00
No. 1 blast furnace	3.50 to 4.00
Cast borings (chem.)	9.50 to 10.00
Unprepared yard scrap	6.00 to 6.50
Light iron	3.00 to 3.50
Per gross ton, delivered local foundries:	
No. 1 machn. cast†	$13.50 to $14.00
No. 2 cast†	10.50 to 11.00

* $1.50 less for truck loads.
† Northern N. J. prices are $2 to $2.50 higher.

BOSTON

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. steel	Nominal
Scrap rails	Nominal
No. 2 steel	Nominal
Breakable cast	$10.15
Machine shop turn.	.... 3.38
Mixed bor. & turn.	$2.00 to 2.25
Bun. skeleton long	.... 8.15
Shafting	10.25 to 10.50
Cast bor. chemical	5.50 to 5.75
Per gross ton delivered consumers' yards:	
Textile cast	$13.50 to $15.00
No. 1 machine cast	13.50 to 15.00

PACIFIC COAST

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$12.50 to $14.00
No. 2 hvy. mltng. steel	11.50 to 13.00

CANADA

Dealers' buying prices at their yards, per gross ton:

	Toronto	Montreal
No. 1 hvy. mltng. steel	$11.00	$10.00
No. 2 hvy. mltng. steel	10.00	9.00
Mixed dealers steel	9.00	8.00
Scrap pipe	5.50	5.00
Steel turnings	4.50	4.00
Cast borings	4.00	3.50
Machinery cast	15.00	14.00
Dealers cast	13.00	12.00
Stove plate	10.00	9.00

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barges	
No. 1 hvy. mltng. steel	$12.00 to $12.25
No. 2 hvy. mltng. steel	10.50 to 10.75
No. 2 cast	.... 11.00
Stove plate	$10.00 to 10.50
Boston on cars at Army Base or Mystic Wharf	
No. 1 hvy. mltng. steel	$13.50 to $14.00
No. 2 hvy. mltng. steel	12.50 to 13.00
Rails (scrap)	.... 14.00
Philadelphia, delivered alongside boats, Port Richmond	
No. 1 hvy. mltng. steel	$14.50 to $15.00
No. 2 hvy. mltng. steel	13.50 to 14.00

PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

(Prices are f.o.b. unless otherwise indicated)

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher. F.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open-hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Gross Ton
Pittsburgh, Chicago or Cleveland	$43.00
Worcester, Mass.	45.00
Birmingham	43.00
San Francisco	52.00

Rods over 9/32 in. or 47/64 in., inclusive, $5 a ton over base.

SOFT STEEL BARS

	Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Buffalo and Birmingham	2.25c.
Detroit, delivered	2.35c.
Duluth	2.35c.
Philadelphia delivered	2.57c.
New York	2.59c.
On cars dock Gulf ports	2.60c.
On cars dock Pacific ports	2.85c.

RAIL STEEL BARS

(For merchant trade)

Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.10c.
On cars dock Tex. Gulf ports	2.45c.
On cars dock Pacific ports	2.70c.

BILLET STEEL REINFORCING BARS

(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Cleveland, Youngstown or Sparrows Pt.	1.90c. to 2.05c.
Detroit, delivered	2.00c. to 2.15c.
On cars dock Tex. Gulf ports	2.25c. to 2.40c.
On cars dock Pacific ports	2.50c.

RAIL STEEL REINFORCING BARS

(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Buffalo, Cleveland, Youngstown or Birmingham	1.75c. to 1.90c.
Detroit, delivered	1.85c. to 2.00c.
On cars dock Tex. Gulf ports	2.10c. to 2.25c.
On cars dock Pacific ports	2.35c.

Prices on reinforcing bars have been subject to concessions of $3 a ton or more from above quotations.

IRON BARS

Chicago and Terre Haute	2.15c.
Pittsburgh (refined)	3.60c.

COLD FINISHED BARS AND SHAFTING*

	Base per Lb.
Pittsburgh, Buffalo, Cleveland, Chicago and Gary	2.70c.
Detroit	2.75c.

* In quantities of 10,000 to 19,999 lb.

PLATES

	Base per Lb.
Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont, Del.	2.10c.
Philadelphia, del'd	2.15c.
New York, del'd	2.29c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.60c.
Wrought iron plates, P't'g	3.80c.

FLOOR PLATES

Pittsburgh or Chicago	3.35c.
New York, del'd	3.71c.
On cars dock Gulf ports	3.70c.
On cars dock Pacific ports	3.95c.

STRUCTURAL SHAPES

	Base per Lb.
Pittsburgh, Chicago, Gary, Buffalo, Bethlehem or Birmingham	2.10c.
Philadelphia, del'd	2.215c.
New York, del'd	2.27c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.70c.

STEEL SHEET PILING

	Base per Lb.
Pittsburgh, Chicago or Buffalo	2.40c.
On cars dock Gulf ports	2.85c.
On cars dock Pacific ports	2.90c.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton	$40.00
Angle bars, per 100 lb	2.70

F.o.b. Basing Points

Light rails (from billets) per gross ton	$40.00
Light rails (from rail steel) per gross ton	39.00

	Base per Lb.
Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast ports	2.25c.
Track bolts, to steam railroads	4.15c.
Track bolts to jobbers, all sizes (per 100 counts)	65-5

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa., Buffalo; on spikes alone, Youngstown, Lebanon, Pa., Richmond, Va.

SHEETS

Hot Rolled

	Base per Lb.
Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown or Chicago	2.15c.
Detroit, delivered	2.25c.
Philadelphia, delivered	2.32c.
Granite City	2.25c.
On cars dock Pacific ports	2.65c.
Wrought iron, Pittsburgh	4.25c.

Cold Rolled*

Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown or Chicago	3.20c.
Detroit, delivered	3.30c.
Granite City	3.30c.
Philadelphia, delivered	3.52c.
On cars dock Pacific ports	3.80c.

* Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base.

Galvanized Sheets, 24 Gage

Pittsburgh, Chicago, Gary, Sparrows Point, Buffalo, Middletown, Youngstown or Birmingham	3.50c.
Philadelphia, delv'd	3.67c.
Granite City	3.60c.
On cars dock Pacific ports	4.00c.
Wrought iron Pittsburgh	6.10c.

Electrical Sheets

(*F.o.b. Pittsburgh*)

	Base per Lb
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Special Motor	4.95c.
Special Dynamo	5.65c.
Transformer	6.15c.
Transformer Special	7.15c.
Transformer Extra Special	7.65c.

Silicon Strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb

Long Ternes

No. 24 unassorted 8-lb. coating f.o.b. Pittsburgh or Gary	3.95c.
F.o.b. cars dock Pacific ports	4.65c.

Vitreous Enameling Stock, 20 Gage*

Pittsburgh, Chicago, Gary, Youngstown, Middletown or Cleveland	3.35c.
Detroit, delv'd	3.45c.
Granite City	3.45c.
On cars dock Pacific ports	3.95c.

TIN MILL PRODUCTS

***Tin Plate**

	Per Base Box
Standard cokes, Pittsburgh, Chicago and Gary	$5.00
Standard cokes, Granite City	5.10

* Prices effective Nov. 10 on shipments through first quarter of 1939.

Special Coated Manufacturing Ternes

	Per Base Box
Granite City	4.40
Pittsburgh or Gary	$4.30

Roofing Terne Plate

(*F.o.b. Pittsburgh*)

(Per Package, 112 sheets, 20 x 28 in.)	
8-lb. coating I.C.	$12.00
15-lb. coating I.C.	14.00
20-lb. coating I.C.	15.00
25-lb. coating I.C.	16.00
30-lb. coating I.C.	17.25
40-lb. coating I.C.	19.50

Black Plate, 29 gage and lighter

Pittsburgh, Chicago and Gary	3.05c.
Granite City	3.15c.
On cars dock Pacific ports, boxed	4.00c.

HOT ROLLED STRIP

(*Widths up to 12 in.*)

	Base per Lb
Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown or Birmingham	2.15c.
Detroit, delivered	2.25c.

Cooperage Stock

Pittsburgh & Chicago	2.25c.

COLD ROLLED STRIP*

	Base per Lb
Pittsburgh, Youngstown or Cleveland	2.95c.
Chicago	3.05c.
Detroit, delivered	3.05c.
Worcester	3.15c.

* Carbon 0.25 and less.

Commodity Cold Rolled Strip

Pittsburgh, Youngstown, or Cleveland	3.10c.
Detroit, delivered	3.20c.
Worcester	3.50c.

COLD ROLLED SPRING STEEL

		Pittsburgh and Cleveland	Worcester
Carbon	0.26-0.50%	2.95c.	3.15c.
Carbon	.51 .75	4.30c.	4.50c.
Carbon	.76-1.00	6.15c.	6.35c.
Carbon	1.01 to 1.25	8.35c.	8.55c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh, Chicago, Cleveland and Birmingham)

To Manufacturing Trade

	Per Lb.
Bright wire	2.60c.
Galvanized wire, base	2.65c.*
Spring wire	3.20c.

* On galvanizing wire to manufacturing trade, size and galvanizing extras are charged, the price Nos. 6 to 9 gage, inclusive, thus being 3.15c.

To the Trade

	Base per Keg
Standard wire nails	$2.45
Coated nails	2.45
Cut nails, carloads	3.60

	Base per 100 Lb.
Annealed fence wire	$2.95
Galvanized fence wire	3.35
Polished staples	3.15
Galvanized staples	3.40
Twisted barbless wire	3.20
Woven wire fence, base column.	67
Single loop bale ties, base col...	56
Stand. 2 pt., 12.5 gage barbed cattle wire, per 80 rod spool..	$2.54

Note: Birmingham base same on above items, except spring wire.

Add $4 a ton for Mobile, Ala.; $5 for New Orleans; $6 for Lake Charles to above bases, except on galvanized and annealed merchant fence wire, which are $1 a ton additional in each case.

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel			*Wrought Iron*		
In.	Black	Galv.	In.	Black	Galv.
⅛	56	36	¼ & ⅜	+9	+30
¼ to ⅜	59	43½	½	24	6½
½	63½	54	¾	30	13
¾	66½	58	1 & 1¼	34	19
1 to 3	68½	60½	1½	38	21½
			2	37½	21

Lap Weld

2	61	52½	2	30½	15
2½ & 3	64	55½	2½ to 3½	31½	17½
3½ to 6	66	57½	4	33½	21
7 & 8	65	55½	4½ to 8.32½		20
9 & 10	64½	55	9 to 12	28½	15
11 & 12	63½	54			

Butt weld, extra strong, plain ends

⅛	54½	41½	¼ & ⅜	+10	+43
¼ to ⅜	56½	45½	½	25	9
½	61½	53½	¾	31	15
¾	65½	57½	1 to 2	38	22½
1 to 3	67	60			

Lap weld, extra strong, plain ends

2	59	51½	2	33½	18½
2½ & 3		55½	2½ to 4.39		25½
3½ to 6	66½	59	4½ to 6.37½		24
7 & 8	65½	56	7 & 8	38½	24½
9 & 10	64½	55	9 to 12	32	20½
11 & 12	63½	54			

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.

Boiler Tubes

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall.

(Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

		Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld Hot Rolled
1 in. o.d.	13 B.W.G.	$ 9.01	$ 7.82	....
1¼ in. o.d.	13 B.W.G.	10.67	9.26	....
1½ in. o.d.	13 B.W.G.	11.79	10.25	$9.72
1¾ in. o.d.	13 B.W.G.	13.42	11.64	11.06
2 in. o.d.	13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d.	13 B.W.G.	16.76	14.54	13.79
2½ in. o.d.	12 B.W.G.	18.45	16.01	15.16
2½ in. o.d.	12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d.	12 B.W.G.	21.42	18.59	17.54
3 in. o.d.	12 B.W.G.	22.48	19.50	18.35
3½ in. o.d.	11 B.W.G.	28.37	24.62	23.15
4 in. o.d.	10 B.W.G.	35.20	30.54	28.66
4½ in. o.d.	10 B.W.G.	43.04	37.35	35.22
5 in. o.d.	9 B.W.G.	54.01	46.87	44.25
6 in. o.d.	7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. or over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

CAST IRON WATER PIPE

	Per Net Ton
*6-in. and larger, del'd Chicago.	$51.00
6-in. and larger, del'd New York	49.00
*6-in. and larger, Birmingham.	43.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles....	52.00
F.o.b. dock, Seattle	52.00
4-in. f.o.b. dock, San Francisco or Los Angeles	55.00
F.o.b. dock, Seattle	52.00

Class "A" and gas pipe, $3 extra 4-in. pipe is $3 a ton above 6-in.

Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $42. Birmingham, and $50 delivered Chicago and 4-in. pipe, $45, Birmingham, and $54 delivered Chicago.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine and carriage bolts: ½ in. & 6 in. and smaller.	65, 5 and 5*
Larger and longer up to 1 in.	60, 10 and 5*
1⅛ in. and larger	60, 5 and 5*
Lag bolts	60, 10 and 5
Plow bolts, Nos. 1, 2, 3 and 7	65, 5 and 5
Hot pressed nuts, and c.p.c. and t nuts, square or hex. blank or tapped: ½ in. and smaller	65 and 5
9/16 in. to 1 in. inclusive.	60, 5 and 5
1⅛ in. and larger	60 and 5

* Less carload lots and less than full container quantity. Less carload lots in full container quantity, an additional 10 per cent discount; carload lots and full container quantity, still another 5 per cent discount.

	Semi-fin. hexagon nuts	U.S.S.	S.A.E.
½ in. and smaller		65-5	70
9/16 to 1 in.		60-10	65
1⅛ in. and larger		60-5	60-5

In full container lots, 10 per cent additional discount.

Stove bolts in packages, nuts attached	75
Stove bolts in packages, with nuts separate	75 and 12½
Stove bolts in bulk	85

On stove bolts freight is allowed to destination on 200 lb. and over.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland Chicago, Birmingham	$3.40

Small Rivets

(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 10

Cap and Set Screws

(Freight allowed to destination)

	Per Cent Off List
Milled hexagon head, cap screws, 1 in. dia. and smaller	50 and 10
Milled square head set screws, case hardened, 1 in. dia. and smaller	75 and 10
Milled headless set screws, cut thread ¾ in. and smaller	68 and 10
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	65 and 10
Upset set screws, cup and oval points	73 and 10
Milled studs	57 and 10

Alloy and Stainless Steel

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Base price, $56.00 a gross ton.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.
Open-hearth grade, base 2.80c.
Delivered, Detroit 2.90c.

S.A.E. Series Numbers	Alloy Differential per 100 Lb.
200 (½% Nickel)	$0.35
2100 (1½% Nickel)	$0.75
2300 (3½% Nickel)	1.55
2500 (5% Nickel)	2.25
3100 Nickel-chromium	0.70
3200 Nickel-chromium	1.85
3300 Nickel-chromium	3.80
3400 Nickel-chromium	3.20
4100 Chromium-molybdenum (0.15 to 0.25 Molybdenum)	0.55
4100 Chromium-molybdenum (0.25 to 0.40 Molybdenum)	0.75
4600 Nickel - molybdenum (0.20 to 0.30 Mo. 1.50 to 2.00 Ni.)	1.10
5100 Chrome steel (0.60-0.90 Cr.)	0.35
5100 Chrome steel (0.80-1.10 Cr.)	0.45
5100 Chromium spring steel	0.15
6100 Chromium-vanadium bar	1.20
6100 Chromium-vanadium spring steel	0.85
Chromium-nickel vanadium	1.50
Carbon-vanadium	0.85

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.40c. base per lb. Delivered Detroit, 3.50c., carlots

CORROSION & HEAT RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

Chrome-Nickel

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25c.	24c.
Plates	29c.	27c.
Structural shapes.	25c.	24c.
Sheets	36c.	34c.
Hot-rolled strip	23.50c.	21.50c.
Cold-rolled strip	30c.	28c.
Drawn wire	25c.	24c.

Straight Chrome

	No. 410	No. 430	No. 442	No. 446
Bars	18.50c.	19c.	22.50c.	27.50c.
Plates	21.50c.	22c.	25.50c.	30.50c.
Sheets	26.50c.	29c.	32.50c.	36.50c.
Hot strip	17c.	17.50c.	23c.	28c.
Cold stp.	22c.	22.50c.	28.50c.	36.50c.

TOOL STEEL

High speed	67c.
High-carbon-chrome	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb higher. West of Mississippi quotations are 3c. a lb. higher.

British and Continental

BRITISH

Per Gross Ton
f.o.b. United Kingdom Ports

Ferromanganese, export	Nominal
Tin plate, per base box	20s. 3d. to 21s. 6d.
Steel bars, open hearth.	£11
Beams, open-hearth	£10 12s. 6d.
Channels, open-hearth	£10 17s. 6d.
Angles, open-hearth	£10 12s. 6d.
Black sheets, No. 24 gage.	£13
Galvanized sheets, No. 24 gage	£15 5s.

CONTINENTAL

Per Gross Ton, Gold £.
f.o.b. Continental Ports

Billets, Thomas	Nominal
Wire rods, No. 5 B.W.G.	£5 10s.
Steel bars, merchant	£5 5s.
Sheet bars	Nominal
Plate ¼ in. and up	£5 7s.
Plate 3/16 in. and 5 mm.	£5 13s.
Sheets ⅛ in.	£5 9s. 6d.
Beams, Thomas	£4 18s.
Angles (Basic)	£4 18s.
Hoops and strip, base	£5 12s.

RAW MATERIALS PRICES

PIG IRON

No. 2 Foundry

F.o.b. Everett, Mass.	$22.75
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md.	$22.00
Delivered Brooklyn	24.50
Delivered Newark or Jersey City	23.53
Delivered Philadelphia	22.84
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	21.00
F.o.b. Buffalo	21.00
F.o.b. Detroit	21.00
Southern, delivered Cincinnati	21.06
Northern, delivered, Cincinnati	21.44
F.o.b. Duluth	21.50
F.o.b. Provo, Utah	19.00
Delivered, San Francisco, Los Angeles or Seattle	24.50
F.o.b. Birmingham*	17.38

* Delivered prices on southern iron for shipment to northern points are 38c. a ton below delivered prices from nearest northern basing point on iron with phosphorus content of 0.70 per cent and over.

Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same, except at Birmingham and Provo, which are not malleable iron basing points.

Basic

F.o.b. Everett, Mass.	$22.25
F.o.b. Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md.	21.50
F.o.b. Buffalo	20.00
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	20.50
Delivered Philadelphia	22.34
Delivered Canton, Ohio	21.89
Delivered Mansfield, Ohio	22.44
F.o.b. Birmingham	16.00

Bessemer

F.o.b. Buffalo	$22.00
F.o.b. Everett, Mass.	23.75
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa.	23.00
Delivered Newark or Jersey City	24.53
Erie, Pa., and Duluth	22.00
F.o.b. Neville Island, Toledo, Chicago and Youngstown	21.50
F.o.b. Birmingham	22.00
Delivered Cincinnati	22.11
Delivered Canton, Ohio	22.89
Delivered Mansfield, Ohio	23.44

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y. $26.50

Gray Forge

Valley or Pittsburgh furnace $20.50

Charcoal

Lake Superior furnace	$25.00
Delivered Chicago	28.34

Canadian Pig Iron

Per Gross Ton

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75	$26.50
No. 2 fdy., sil. 1.75 to 2.25	25.50
Malleable	26.00
Basic	25.50

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$27.50
No. 2 fdy., sil. 1.75 to 2.25	27.00
Malleable	27.50
Basic	27.00

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload) $92.50

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%	$28.00
Domestic, 26 to 28%	33.00

Electric Ferrosilicon

Per Gross Ton Delivered; Lump Size

50% (carload lots, bulk)	$69.50*
50% (ton lots in 50 gal. bbl.)	80.50*
75% (carload lots, bulk)	126.00*
75% (ton lots in 50 gal. bbl.)	139.00*

Bessemer Ferrosilicon

F.o.b. Furnace, Jackson, Ohio
Per Gross Ton

10.00 to 10.50% $30.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2%, $1 per ton additional. Phosphorus 0.75% or over, $1 per ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton

F.o.b. Jackson, Ohio, 5.00 to 5.50% $24.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots, Lump Size, on Contract

4 to 6% carbon	10.50c.*
2% carbon	16.50c.*
1% carbon	17.50c.*
0.10% carbon	19.50c.*
0.06% carbon	20.00c.*

Silico-manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon	$92.75
2.50% carbon	97.75
2% carbon	102.75
1% carbon	112.75

Other Ferroalloys

Ferrotungsten, per lb. contained W del., carloads, nominally	$2.00
Ferrotungsten, lots of 500 lbs. nominally	2.05
Ferrotungsten, smaller lots, nominally	2.10
Ferrovanadium, contract, per lb. contained V., delivered	$2.70 to $2.90†
Ferrocolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., tons lots.	$2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract per net ton	$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton	$157.50
Ferrophosphorus, electric or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic, 23-26% in car lots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, $3 unitage, freight equalized with Nashville	$75.00
Ferromolybdenum, per lb. Mo. f.o.b. furnace	95c.
Calcium molybdate, per lb. Mo. f.o.b. furnace	80c.

*Spot prices are $5 per ton higher
†Spot prices are 10c. per lb. of contained element higher.

ORES

Lake Superior Ores

Delivered Lower Lake Ports
Per Gross Ton

Old range, Bessemer, 51.50%	$5.25
Old range, non-Bessemer, 51.50%	5.10
Messabi, Bessemer, 51.50%	5.10
Messabi, non-Bessemer, 51.50%	4.95
High phosphorus, 51.50%	4.85

Foreign Ore

C.i.f. Philadelphia or Baltimore
Per Unit

Iron, low phos., copper free, 55 to 58% dry, Algeria	12c.
Iron, low phos., Swedish, average, 68½% iron	12½c.
Iron, basic or foundry, Swedish, aver. 65% iron	11c.
Iron, basic or foundry, Russian, aver. 65% iron	Nominal
Man., Caucasian, washed 52%	31c.
Man., African, Indian, 44-48%	29c.
Man., African, Indian, 49-51%	31c.
Man., Brazilian, 46 to 48½%	28c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered	$19.50
Tungsten, domestic, scheelite delivered	$18.00 to $19.00
Chrome ore (lump) c.i.f. Atlantic Seaboard, per gross ton: South African (low grade)	$15.00
Rhodesian, 45%	19.00
Rhodesian, 48%	23.00
Turkish, 48-49%	23.00
Turkish, 45-46%	19.00
Turkish, 40-44%	16.00
Chrome concentrates (Turkish) c.i.f. Atlantic Seaboard, per gross ton: 50%	$24.00
48-49%	22.50

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail	$17.00 to $18.00
Domestic, f.o.b. Ohio River landing barges	18.00
No. 2 lump, 85-5, f.o.b. Kentucky and Ill. mines	18.00
Foreign, 85% calcium, fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	24.50
Domestic No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	31.50

FUEL OIL

Per Gal

No. 2 or diesel, f.o.b. Bayonne	4.125c.
No. 6, f.o.b. Bayonne	2.26c.
Del'd Chicago, No. 5 Bur. Stds.	3.25c.
Del'd Chicago, No. 6 Bur. Stds.	2.75c.
Del'd Cleve'd, No. 3 distillate	5.50c.
Del'd Cleve'd, No. 4 industrial	5.25c.
Del'd Cleve'd, No. 5 industrial	3.00c.
Del'd Cleve'd, No. 6 industrial	2.75c.

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, Prompt	$3.75
Foundry, f.o.b. Connellsville, Prompt	$4.75 to 5.50
Foundry, by-product, Chicago ovens	10.25
Foundry, by-product, del'd New England	12.50
Foundry, by-product, del'd Newark or Jersey City	10.88 to 11.40
Foundry, by-product, Philadelphia	10.95
Foundry, by-product, delivered Cleveland	10.30
Foundry, by-product, delivered Cincinnati	9.75
Foundry, Birmingham	7.50
Foundry, by-product, del'd St. Louis industrial district	10.75 to 11.00
Foundry, from Birmingham, f.o.b. cars dock Pacific ports	14.75

IRON AND STEEL WAREHOUSE PRICES

PITTSBURGH

	Base per Lb.
Plates	3.55c.
Shapes	3.55c.
Soft steel bars and small shapes	3.60c.
**Reinforcing steel bars	2.70c.
Cold finished bars and screw stock	3.95c.
Hot rolled strip	3.75c.
Hot rolled sheets	3.50c.
Galv. sheets (24 ga.) 500 lb. to 1499 lb.	4.50c.
Wire, black, soft annealed	3.15c.
Wire, galv., soft	3.55c.
Track spikes (1 to 24 kegs)	3.75c.
Wire nails (in 100-lb. kegs)	2.65c.

On plates, structurals, bars, strip and hot rolled sheets, base applied to orders of 400 to 1999 lb.

** On reinforcing bars base applies to orders of less than one ton and includes switching and carting charge.

All above prices for delivery within the Pittsburgh switching district.

NEW YORK

	Base per Lb.
Plates, ¼ in. and heavier	3.83c.
Structural shapes	3.75c.
Soft steel bars, round	3.94c.
Iron bars, Swed. charcoal	7.50 to 8.25c.
Cold-fin. shafting and screw stock:	
Rounds, squares, hexagons	4.39c.
Flats up to 12 in. wide	4.39c.
Cold-rolled strip, soft and quarter hard	3.66c.
Hot-rolled strip, soft O.H.	4.11c.
Hot-rolled sheets (10 ga.)	3.73c.
Galv. sheets (24 ga.)	4.60 to 4.85c.
Long ternes (24 ga.)	5.50 to 6.20c.
Cold-rolled sheets (20 ga.)	
Standard quality	4.90c.
Deep drawing	5.15c.
Stretcher leveled	5.50c.
SAE, 2300, hot-rolled	7.50c.
SAE, 3100, hot-rolled	6.10c.
SAE, 6100, hot-rolled annealed	10.25c.
SAE, 2300, cold-rolled	8.69c.
SAE, 3100, cold-rolled, annealed	7.29c.
Floor plate, ¼ in. and heavier	5.43c.
Standard tool steel	12.50c.
Wire, black, annealed (No. 9)	4.65c.
Wire, galv. (No. 9)	5.00c.
Open-hearth spring steel	4.75c. to 10.25c.
Common wire nails, per keg in 25 keg lots	$3.25

CHICAGO

	Base per Lb.
Plates and structural shapes	3.55c.
Soft steel bars, rounds and angles	3.60c.
Soft steel squares, hexagons, channels and Tees	3.75c.
Hot rolled strip	3.75c.
Floor plates	5.15c.
Hot rolled sheets	3.50c.
Galvanized sheets	4.50c.
Cold rolled sheets	4.45c.
Cold finished carbon bars	4.05c.

Above prices are subject to deductions and extras for quantity and are f.o.b. consumer's plant within Chicago free delivery zone.

CLEVELAND

	Base per Lb.
Plates	3.55c.
Structural shapes	3.73c.
Soft steel bars	3.50c.
Reinfor. bars (under 2000 lb.)†	2.55c.
Cold-fin. bars (1000 lb., over)	4.05c.
Hot-rolled strip	3.65c.
Cold rolled sheets	4.70c.
Cold-finished strip	3.35c.
Galvanized sheets (No. 24)	4.62c.
Hot-rolled sheets	3.50c.
Floor plates, 3/16 in. and heavier	5.33c.
*Black ann'l'd wire, per 100 lb.	$3.10
*No. 9 galv. wire, per 100 lb.	3.50
*Com. wire nails, base per keg	2.60
Hot rolled alloy steel (3100)	6.05c.
Cold rolled alloy steel (3115)	6.85c.

* For 5000 lb. or less
† 500 lb., base quantity.

Prices shown on hot rolled bars, strip, sheets, shapes and plates are for 400 to 1999 lb. Alloy steel, 1000 lb. and over; galvanized sheets, 150 to 1499 lb.; cold rolled sheets, 399 lb. and under.

ST. LOUIS

	Base per Lb.
Plates and structural shapes	3.82c.
Bars, soft steel (rounds and flats)	3.87c.
Bars, soft steel (squares, hexagons, ovals, half ovals and half rounds)	4.02c.
Cold fin. rounds, shafting, screw stock	4.32c.
Galv. sheets (24 ga.)	4.77c.
Hot rolled sheets	3.77c.
Galv. corrugated sheets, 24 ga. and heavier*	4.82c.
Structural rivets	5.02c.

* No. 16 and lighter take special prices.

BOSTON

	Base per Lb.
Structural shapes, 3 in. and larger	5.85c.
Plates, ¼ in. and heavier	3.85c.
Bars	3.98c.
Heavy hot rolled sheets	3.86c.
Hot rolled sheets	4.21c.
Hot rolled annealed sheets	4.76c.
Galvanized sheets	4.76c.
Cold rolled sheets	4.93c.

The following quantity differentials apply: Less than 100 lb., plus $1.50 per 100 lb.; 100 to 399 lb. plus 50c.; 400 to 1999 lb. base; 2000 to 9999 lb. minus 20c.; 10,000 to 39,999 lb. minus 30c.; 40,000 lb. and over minus 40c.

BUFFALO

	Base per Lb.
Plates	3.77c.
Floor plates	5.40c.
Struc. shapes	3.55c.
Soft steel bars	3.60c.
Reinforcing bars (20,000 lb. or more)	2.05c.
Cold-fin. flats, squares, rounds, and hex.	4.05c.
Hot-rolled sheets, 3/16 x 14 in. to 48 in. wide incl. also sizes No. 8 to 30 ga.	3.50c.
Galv. sheets (24 ga.)	4.50c.
Bands and hoops	3.97c.

NEW ORLEANS

	Base per Lb.
Mild steel bars	4.20c.
Reinforcing bars	3.24c.
Structural shapes	4.10c.
Plates	4.10c.
Hot-rolled sheets, No. 10	4.35c.
Steel bands	4.75c.
Cold-finished steel bars	5.10c.
Structural rivets	4.85c.
Boiler rivets	4.85c.
Common wire nails, base per keg	3.55
Bolts and nuts, per cent off list	60

REFRACTORIES PRICES

Fire Clay Brick

	Per 1000 f.o.b. Works
Super-duty brick, at St. Louis	$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1, Ohio	39.90
Ground fire clay, per ton	7.10

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$47.50
Chicago District	56.05
Birmingham	47.50
Silica cement per net ton (Eastern)	8.55

Chrome Brick

	Per Net Ton
Standard f.o.b. Baltimore, Plymouth Meeting and Chester	$47.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	47.00

Magnesite Brick

	Per Net Ton
Standard f.o.b. Baltimore and Chester	$67.00
Chemically bonded, f.o.b. Baltimore	57.00

Grain Magnesite

	Per Net Ton
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	$45.00
Domestic, f.o.b. Baltimore and Chester, in sacks	40.00
Domestic, f.o.b. Chewelah Wash. (in bulk)	22.00

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	3.40c.
*Structural shapes	3.40c.
*Soft steel bars, small shapes, iron bars (except bands)	3.60c.
‡Reinforc. steel bars, square and deformed	2.61c.
Cold-finished steel bars	4.36c.
*Steel hoops	4.10c.
*Steel bands, No. 12 and 3/16 in. incl.	3.60c.
*Spring steel	4.75c.
†Hot-rolled anneal. sheets	3.40c.
†Galvanized sheets (No. 24)	4.50c.
*Diam. pat. floor plates, ¼ in.	5.00c.

These prices are for delivery in Philadelphia trucking area.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.

†For 25 bundles or over.

‡For one to five tons.

BIRMINGHAM

Bars and bar shapes	$3.85 base	
Structural shapes and plates	3.75 "	
Hot rolled sheets No. 10 ga.	3.80 "	
Hot rolled sheets No. 24 ga.	4.40 "	3500 lb. and over
Galvanized sheets No. 24 ga.	5.05 "	3500 lb. or more
Strip	4.05 "	
Reinforcing bars	3.85 "	
Floor plates	5.96 "	
Cold finished bars	4.91 "	
Machine and carriage bolts	.50 & 10 off list	
Rivets (structural)	$4.60 base	

On plates, shapes, bars, hot-rolled strip heavy hot-rolled sheets, the base applies on 400 to 3999 lb. All prices are f.o.b. consumer's plant.

PACIFIC COAST

Base per Lb.

	San Francisco	Los Angeles	Seattle
Plates, tank and U. M.	3.85c.	4.00c.	4.05c.
Shapes, standard	3.95c.	4.00c.	4.05c.
Soft steel bars	4.05c.	4.00c.	4.30c.
Reinforcing bars, f.o.b. cars dock Pacific ports	2.675c.	open.	2.975c.
Hot-rolled sheets (No. 10)	4.00c.	4.20c.	4.20c.
Galv. sheets (No. 24 and lighter)	5.15c.	5.05c.	5.50c.
Galv. sheets (No. 22 and heavier)	5.40c.	5.05c.	5.50c.
Cold-finished steel			
Rounds	6.55c.	6.60c.	7.10c.
Squares and hexagons	7.80c.	7.85c.	7.10c.
Flats	8.30c.	8.35c.	8.10c.
Common wire nails—base per keg less carload	$3.20	$3.05	$3.00

All items subject to differentials for quantity.

ST. PAUL

	Base per Lb.
Mild steel bars, rounds	4.10c.
Structural shapes	4.00c.
Plates	4.00c.
Cold-finished bars	4.83c.
Hot-rolled annealed sheets, No. 24	4.75c.
Galvanized sheets, No. 24	5.00c.

On mild steel bars, shapes and plates the base applies on 400 to 14,999 lb. On hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over. Base on cold-finished bars is 1000 lb. and over of a size.

MEMPHIS

	Base per Lb.
Mild steel bars	4.01c.
Shapes, bar size	4.01c.
Iron bars	4.01c.
Structural shapes	3.96c.
Plates	3.96c.
Hot-rolled sheets	3.91c.
Galvanized sheets, No. 24	5.26c.
Steel bands	4.16c.
Cold-drawn rounds	4.61c.
Cold-drawn flats, squares, hexagons	6.61c.

PLANT EXPANSION AND EQUIPMENT BUYING

NORTH ATLANTIC

Tide Water Associated Oil Co., 17 Battery Place, New York, plans rebuilding part of refinery at Bayonne, N. J., including filter division, recently destroyed by fire. Loss about $100,000 with equipment. Filter unit, used for lubricating oil production, occupied a structure 30 x 100 ft., 60 ft. high.

Commanding Officer, Ordnance Department, Watervliet Arsenal, Watervliet, N. Y., asks bids until Dec. 30 for one gas carburizing furnace (Circular 94).

John Morgan, Inc., 68 Flushing Avenue, Brooklyn, manufacturer of beverages, has leased floors in six adjoining buildings of New York Dock Co., 313-18 Van Dyke Street, South Brooklyn, totaling about 60,000 sq. ft. of floor space, for plant, including mechanical-bottling department and other divisions. Company also has taken an option to lease 40,000 sq. ft. additional space in same buildings later.

A. W. Porter, Inc., 50 Pine Street, New York, investment securities, acting for a company whose name is temporarily withheld, has closed negotiations with City Council, Pensacola, Fla., for site for construction of a shipbuilding and repair plant. Municipality will expend about $1,000,000 in dredging, landfilling and bulk-heading a waterfront tract and will arrange bond issue in that amount at early date. Plant will comprise one-story shops with shipways and other operating facilities. Cost reported over $500,000 with equipment.

Koline Machine Corp., New York, recently organized to manufacture mechanical equipment, has leased space in building at 27-37 West Sixtieth Street for a machine shop.

Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, asks bids until Jan. 4 for 900 frequency meter sets (Circular 110); until Jan. 6 for 15,840,000 to 42,240,000 ft. of wire (Circular 117), 6600 to 17,600 reels (Circular 118).

Board of Education, Park Avenue and Fifty-ninth Street, New York, will place superstructure under way at once on new 11-story and basement industrial High School of Needle Trades, 197 x 200 ft., between Seventh and Eighth Avenues, Twenty-fourth to Twenty-fifth Streets, for which general contract recently was let to J. Weinstein & Rubin Building Corp., 11 West Forty-second Street. Installation will include 65 shops, six laboratories and other industrial departments. Cost close to $4,500,000 with equipment.

Quartermaster, West Point, N. Y., asks bids until Dec. 27 for 29,500 ft. of copper wire, 2000 ft. of single-conductor copper wire, 4000 ft. of cable, machine screws and other equipment (Circular 1052-60); until Dec. 28, parts for coal conveyor system, including sprocket wheels, gears, etc.; parts for stokers and boilers, elevator buckets, motor brushes, level meters and other equipment (Circular 1052-61).

Central School District No. 1, Margaretville, N. Y., plans installation of manual training equipment in new two-story central school, for which bids have been asked on general contract. Cost about $400,000 exclusive of equipment. H. O. Fullerton, 152 Washington Avenue, Albany, N. Y., is architect.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until Dec. 27 for one brake drum turning machine (Circular 460); 2000 lb. of angular steel grit (Circular 461); until Dec. 28, reworking 41,500 lb. of brass turnings (Circular 422); until Jan. 4, one drawing, forming and assembling automatic machine (Circular 446).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 6 for steel tap rivets and bolts (Schedule 5127), chain conveyors, with carriers and sprockets (Schedule 5128) for Philadelphia and Brooklyn Navy yards.

Hugh H. Eby, Inc., 2066 Hunting Park Avenue, Philadelphia, manufacturer of electrical equipment, radio apparatus, parts, etc., has acquired one and two-story buildings at Stenton and Abbottsford Avenues, on site 150 x 159 ft., and will improve for plant.

Commanding Officer, Ordnance Department, Frankford Arsenal, Philadelphia, asks bids until Dec. 27 for one geared-head turret lathe, 2½-in. bar capacity (Circular 554), 25 resilient assembly supports (Circular 551); until Dec. 28, one automatic link loading machine for cartridges (Circular 547), one recoil mount for machine guns (Circular 565).

BUFFALO DISTRICT

Board of Education, Central School District No. 1, Naples, N. Y., plans manual training equipment in new two-story high and grade school, for which general contract has just been let to Swarthout & Rowley, 548 Mount Hope Avenue, Rochester, N. Y. Cost about $305,000 exclusive of equipment. R. R. Graham, 25 Prospect Street, Middletown, N. Y., is architect.

Socony-Vacuum Oil Co., 1100 Elk Street, Buffalo, has let general contract to Charles A. Smith, 375 Plymouth Avenue, for one and multi-story additions to local oil refinery. Cost close to $50,000 exclusive of equipment. This is initial work on expansion program to be carried out at plant, estimated to cost over $1,000,000 with machinery, steel tank storage facilities and other equipment. Main offices of company are in New York.

Board of Education, City Hall, Buffalo, asks bids until Dec. 29 for metal partitions and commercial educational equipment. James Storer is secretary.

WASHINGTON DIST.

Chemical Warfare Service, Edgewood Arsenal, Edgewood, Md., asks bids until Jan. 4 for faceblank dies, and grommet and retainer rings crimping dies (Circular 172).

Consolidated Gas, Electric Light & Power Co., Lexington Building, Baltimore, has approved plans for expansion and improvements in steam-electric generating station at Westport, including new 33,000-hp. steam turbo-generator unit and accessories, high-pressure boilers and auxiliary equipment; award for generator has been placed with General Electric Co., and for boilers with Combustion Engineering Co., New York. Contracts for other equipment will be placed soon. Cost about $3,500,000 with equipment.

General Purchasing Officer, Panama Canal, Washington, asks bids until Dec. 27 for copper magnet wire, electric range wire, tin-lead wire solder, brass fire hose nozzles, copper cord and other equipment (Schedule 3406).

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Dec. 28 for power house equipment at Norfolk Navy Yard, including boilers, pulverized coal or stoker equipment, mechanical draft fans, preheaters or economizers, boiler accessories, air and flue gas ducts, piping and other equipment (Specifications 8822).

Hercules Powder Co., Delaware Trust Building, Wilmington, Del., plans new plant at Hopewell, Va., adjoining present works, for production of ethyl cellulose. Cost over $600,000 with machinery.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 6 for four motor-driven turret lathes and extra equipment (Schedule 5106), nickel-copper alloy cylinder forgings (Schedule 5147), three motor-driven, pedestal-type milling machines and equipment (Schedule 5090) for Washington yard; 10 electric arc welding sets (Schedule 5145) for Norfolk yard; one motor-driven grinder (Schedule 5155), two motor-driven engine lathes (Schedule 5156) for submarine base; one 250-hp. portable firebox steel boiler (Schedule 5135) for Portsmouth, N. H., yard; one motor-driven toolroom-type lathe (Schedule 5091) for Eastern yard.

SOUTH ATLANTIC

Cook Body Co., Dowd Road and Wilkinson Boulevard, Charlotte, N. C., automobile bodies, plans rebuilding part of plant recently destroyed by fire. Loss about $50,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 6 for 15 welding outlet pans and reactors (Schedule 5162).

City Council, Burlington, N. C., asks bids until Dec. 29 for new two-unit municipal incinerator, 60 tons capacity, with furnace units, conveyors and other equipment. Appropriation of $40,000 has been arranged. Linberg Engineers, Inc., Burlington, is engineer.

NEW ENGLAND

Bard Parker Co., Lee Mac Avenue, Danbury, Conn., manufacturer of surgeon's knives and other cutlery, has arranged with Danbury Industrial Corp., owner of plant site, for one-story addition, 50 x 90 ft., for which general contract has been let to Hewlett Construction Co., 1385 Iranistan Avenue, Bridgeport, Conn. Cost about $45,000 with equipment.

Commanding Officer, Ordnance Department, Springfield Armory, Springfield, Mass., asks bids until Dec. 27 for gages, including taper, plug, bullet seat, cornering, etc. (Circular 211); until Jan. 5, two vertical surface grinders (Circular 200), broaching machine (Schedule 188), automatic cylinder type vertical printing press and automatic paper-cutting machine (Circular 206); until Jan. 6, 16 motor-driven automatic small milling machines (Circular 203).

Shawinigan Resins Corp., Indian Orchard, Mass., manufacturer of cellulose products, has let general contract to Adams & Ruxton Construction Co., 1387 Main Street, Springfield, Mass., for one-story addition, 33 x 100 ft. Cost over $60,000 with equipment. Company is a subsidiary of Monsanto Chemical Co., St. Louis.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 6 for one motor-driven tapping machine (Schedule 4946), one 2½-ton hand-operated, pillar crane (Schedule 5137), alloy steel forgings (Schedule 5174) for Newport, R. I., naval station.

OHIO AND INDIANA

Triplex Screw Co., 5317 Grant Avenue, Cleveland, cap screws, studs, nuts, etc., has let general contract to Schummelman Co., 1173 Sylvania Road, for one-story addition, 90 x 220 ft. Cost over $65,000 with equipment.

City Council, Amherst, Ohio, will take bids soon for new municipal electric power plant, including two 345-kw. and one 125-kw. diesel engine-generator units and auxiliary equipment. Cost about $145,000. Financing has been arranged through Federal aid. Floyd G. Browne, Marion, Ohio, is consulting engineer.

City Council, City Hall, Cincinnati, C. O. Sherrill, city manager, has let general contract to Penker Construction Co., 1030 Summer Street, for one-story municipal service, repair and garage building at Bates Avenue and Central Parkway, including equipment shops and other mechanical facilities for public works department motor trucks and cars. Cost about $510,000 with equipment. Financing has been arranged through Federal aid. Tietig & Lee, 34 West Sixth Street, are architects; Fosdick & Hilmer, Union Trust Building, are consulting engineers.

Contracting Officer, Material Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until Dec. 27 for chemical tank knives, shafts, lubricators, lever and main assemblies, tank rings, nuts, guides, plates, washers, gear as-

sembly, etc. (Circular 450), power and lighting aircraft cable, high-tension ignition cable, power and lighting armored cable, lead-covered rubber-insulated cable, steel tape armored cable, rubber-covered wire, weatherproof wire, bare resistance wire, rubber-insulated wire (Circular 451), six electric furnaces (Circular 462), air compressor rotor bearings, ball bearings, electric motor brush springs and other equipment (Circular 470), 18 wood-cutting bandsaws, and 348 hand hack saws (Circular 467), 10 portable electric arc welders (Circular 466); until Dec. 29, 50 to 300 fuel pump assemblies (Circular 430); until Dec. 30, two motor-driven, toolroom precision lathes (Circular 468).

Pitman-Moore Co., 1220 Madison Avenue, Indianapolis, manufacturer of drugs, industrial chemicals, etc., plans one-story addition. Cost about $300,000 with equipment. Work is scheduled to begin at once.

SOUTH CENTRAL

Southdown Sugar Refinery, Houma, La., plans rebuilding cane sugar refinery on Bayou Black, recently destroyed by fire. Loss over $500,000 with machinery. Property is owned by Realty Operators, Inc., Marine Building, New Orleans, W. Cameron Byrne, vice-president, which will carry out project.

Fayette County Board of Trustees, Lexington, Ky., George Vaughn, president, will take bids soon for new steam power house at institution on Georgetown Pike, with facilities for central heating. Cost over $75,000 with equipment. Frankel & Curtis, McClelland Building, are architects.

United States Engineer Office, Vicksburg, Miss., asks bids until Dec. 27 for one concrete testing machine (Circular 140), plow steel wire rope (Circular 141).

WESTERN PA. DIST.

E. I. du Pont de Nemours & Co., Inc., Rayon Division, du Pont Building, Wilmington, Del., has approved plans for new unit at works at Belle, W. Va., for production of chemical intermediates for nylon rayon manufacture at new mill at Seaford, Del., on which work will begin soon. Cost over $200,000 with equipment.

United States Engineer Office, New Postoffice Building, Pittsburgh, asks bids until Jan. 12 for six steel slide gates and three sets of conduit liners (Circular 364).

Board of Ohio County Commissioners, Wheeling, W. Va., has acquired about 500 acres on Ohio-Brooke County line, Short Creek district, for new county airport. Bids will be asked soon for hangars, repair and reconditioning shops, administration building, oil and gasoline storage and distributing building and other structures. Fund of about $1,000,000 has been arranged for project, including a Federal grant.

MICHIGAN DISTRICT

Detroit Sulphite Pulp & Paper Co., 9125 West Jefferson Street, Detroit, manufacturer of wrapping papers, tissue and other paper stocks, will take bids soon on general contract for one-story addition, 100 x 100 ft. Cost over $90,000 with equipment.

Masco Screw Products Co., 2700 Franklin Street, Detroit, plans early rebuilding part of plant recently destroyed by fire. Loss close to $175,000 with equipment.

American Porcelain Enamel Co., 605 West Western Avenue, Muskegon, Mich., recently organized with capital of $100,000, is selecting site for one-story plant for production of porcelain enameled products, including parts for stoves, washing machines, refrigerators, etc. Initial plant will cost close to $50,000 with equipment. New company is headed by E. C. Farmer and Robert Long, Occidental Hotel, Muskegon.

City Council, Birmingham, Mich., has low bid from Darin & Armstrong, Inc., 2041 Fenkel Street, Detroit, for one-story municipal equipment storage, distributing and repair building, with service and garage facilities, at $33,053 exclusive of equipment.

SOUTHWEST

City Council, Kansas City, Kan., has asked bids for excavations and piling, and will take bids soon for superstructure for new municipal food terminal in public levee district, near Kaw River, to consist of eight one and multi-story buildings for food storage and distribution, with cold storage plant, incinerator and other structures. Cost about $4,250,000 with equipment, including conveyors, loaders, factory trucks and other mechanical-handling equipment. Alonzo H. Gentry, Voskamp & Neville, Inc., 4 West Thirteenth Street, Kansas City, Mo., is architect; Walter F. Schultz, Shrine Building, Memphis, Tenn., is consulting engineer.

City Council, Columbia, Mo., has let general contract to Oldham Construction Co., Columbia, for hangar at municipal airport, 100 x 100 ft., with shop and reconditioning facilities. Cost close to $45,000 with equipment. William M. Spann, Interstate Building, Kansas City, Mo., is consulting engineer.

Board of Education, Sixth and Osage Streets, Bartlesville, Okla., has asked bids on general contract for one-story manual training school on Country Club Road. Cost about $100,000 with equipment. Arthur Gorman, 115 East Eighteenth Street, is architect.

Crane Co., Corpus Christi, Tex., has let general contract to H. E. Woodruff, Corpus Christi, for one-story factory branch, storage and distributing plant at 1212 Gavilan Street. Cost about $50,000 with equipment. Hamon & Co., Texas State Bank Building, are architects. Main offices of company are at Chicago.

Seven-Up Bottling Co., Austin, Tex., has let general contract to Scott Yeamans, 508 West Avenue, for new two-story and basement mechanical-bottling plant, 80 x 95 ft. Cost about $45,000 with equipment.

Commanding Officer, Ordnance Department, San Antonio Arsenal, San Antonio, Tex., asks bids until Jan. 4 for wrenches, pliers, tool stands, etc. (Circular 17).

MIDDLE WEST

Precision Metal Workers, Inc., 3100 Carroll Avenue, Chicago, manufacturer of metal products, has let general contract to Algot B. Larson, 3833-37 West Lake Street, for one-story machine shop. Cost close to $40,000 with equipment. Milton C. Carstens, 1 North LaSalle Street, is architect.

International Filter Co., 339-47 West Twenty-fifth Street, Chicago, manufacturer of hydraulic control equipment, water purification apparatus, etc., has let general contract to Heidel & Beck, Inc., 6235 South Michigan Avenue, for one-story and basement addition, 125 x 140 ft. Cost over $60,000 with equipment. A. Epstein, 2001 West Pershing Road, is architect and engineer.

United States Engineer Office, Commerce Building, St. Paul, Minn., asks bids until Dec. 28 for one portable gasoline engine-operated fire pump (Circular 45).

City Council, City Hall, Minneapolis, Minn., will take bids soon on general contract for one-story addition to municipal equipment storage and repair shop at 1308 Currie Avenue. Cost about $180,000 with equipment. Fred T. Paul, Court House, is city engineer.

Ace Hardware Corp., 466 West Superior Street, Chicago, hardware and allied products, has leased about 70,000 sq. ft. of floor space in building at 1319 South Michigan Avenue, and will remodel for occupancy in January. Present plant will be removed to new location.

United States Engineer Office, Fort Peck, Mont., asks bids until Dec. 29 for 20 dredge pump casings and 14 impellers for 28-in. dredge pump (Circular 189).

Rath Packing Co., Waterloo, Iowa, meat packer, has let general contract to Jens Olesen & Sons Co., 1760 Sycamore Street, for five-story and basement addition, 142 x 216 ft. Cost close to $325,000 with equipment. Henschien, Everds & Crombie, 59 East Van Buren Street, Chicago, are architects and engineers.

Lafayette County Board, Darlington, Wis., has plans for a County highway garage and maintenance shop, 75 x 220 ft., one-story and part basement, to cost about $75,000. Wallace Pennison is county highway commissioner.

Crawford Electric Co-operative, Gays Mills, Wis., closed bids Dec. 19 for construction of 114 miles of distribution system under Wisconsin Development Authority, 524 Tenney Building, Madison, Wis., at estimated cost of $139,000. Fred Reed is secretary and treasurer.

Waupaca Electric Co-operative, Iola, Wis., closed bids Dec. 21 for construction of 137 miles of rural electric transmission lines to cost about $151,000. William S. Selmer is secretary and treasurer.

Board of Education, Wauwatosa, Wis., is asking bids until Dec. 23 for technical equipment in new $400,000 addition to senior-junior high school. Earl H. Roberts is secretary of board.

PACIFIC COAST

Los Angeles Water and Power Department, 207 South Broadway, Los Angeles, will take bids soon for one-story cable storage and distributing building, 45 x 110 ft., at department underground headquarters, First and Boylston Streets. Cost about $80,000 with equipment. About February, bids will be asked for two one-story mechanical shops and other buildings at same location.

American Wholesale Hardware Co., Long Beach, Cal., has let general contract to W. E. Allen, 745 West Fourteenth Street, for one-story storage and distributing building, 100 x 250 ft., at 1500 West Anaheim Street. Cost over $60,000 with equipment. J. H. Davies, Ocean Center Building, is consulting engineer.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Jan. 18 for superstructure for one-story assembly and repair shop at naval air station, Alameda, Cal. (Specifications 9033).

Butler Packing Co., Tacoma, Wash., food products, has let general contract to J. W. Bailey Construction Co., Insurance Building, Seattle, for one-story branch plant, 61 x 150 ft., at Seattle. Cost over $50,000 with equipment. Sutton, Whitney & Dugan, Rust Building, are architects; Putnam Engineering Co., Provident Building, is consulting engineer, both Tacoma.

Western Foundry Co., Portland, plans rebuilding pattern shop recently destroyed by fire. Loss close to $50,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 4 for spare parts for diesel engines (Schedule 900-2247), spare parts for diesel engines, including compression piston rings, oil drain piston rings and oil scraper piston rings (Schedule 900-2248); until Jan. 6, four motor-driven plain vertical milling machines (Schedule 5067) for Mare Island Navy Yard; parts for airplanes (Schedule 900-2236) for San Diego Naval Air Station; one light-type horizontal universal milling machine (Schedule 5084) for Keyport, Wash., yard; 10 pedestal grinders (Schedules 5077, 5078 and 5082), one vertical metal shaper (Schedule 5087), one hollow chisel mortiser (Schedule 5079), all motor-driven, for Puget Sound yard.

FOREIGN

James Booth & Co., Ltd., Birmingham, England, manufacturer of metals and metal alloy products, has acquired about 30 acres heretofore held by municipality, for new plant for production of light aluminum and other allied metal alloys. Cost close to $1,000,000 with equipment.

Public Works Department, Wellington, New Zealand, asks bids until Jan. 31 for turbine units, generators and accessories for Waikaremoana power project (Section 157); until Feb. 14 for auxiliary generator units and exciter sets, control equipment and accessories, same project (Section 159).

Sterling Rubber Co., Ltd., Guelph, Ont., general rubber products, has approved plans for two-story and basement addition, 50 x 100 ft. Cost about $60,000 with equipment.

THIS WEEK'S MACHINE ...TOOL ACTIVITIES...

. . . Year-end dip in sales not as drastic as expected . . . Sellers look for larger tooling programs in 1939, led by International Harvester's $10,000,000 appropriation . . . Armament programs an important current sales factor.

International Harvester Appropriates $10,000,000 for Machinery

CHICAGO—International Harvester Co. is said to have appropriated about $10,000,000 for machinery and other equipment at certain of its plants, the installation deadline at some to be May 1. Considerable activity from this one source alone is thus certain to be seen early in 1939, and throughout the year. Other work is proceeding at a slow rate, and it appears that little will be done until after the first of the year. The Ordnance Department has spent about $2,000,000 in educational orders in this district in 1938, and will have the same amount available next year as part of a five-year program. Thus far, three plants have been tooled for gas masks, which involves little save punch presses, two plants for shell forgings, and one will be selected in January for 75-mm. shell production. Manufacture of semi-automatic rifles is another project not yet begun, but which will require considerable equipment. Plants chosen for these orders are not necessarily low bidders but those which it is decided will fit into the plan most efficiently.

Armament Programs Sustain Cincinnati Builders

CINCINNATI — Armament programs, both domestic and foreign, sustained machine tool demand the past week at the revived level of the preceding period. Of course, retooling programs in other industries, particularly agricultural implement and automotive, are contributing to the steady background, but the more noticeable buying appears to have a military motive. Domestic business gained a bit on export buying last week, but the disparity between the two sources is still wide. Lathe demand was predominantly domestic with only a few for out of the country, while the opposite was true of milling and grinding tools. An agricultural implement manufacturer was in the market for several rebuilt crankshaft lathes and an order for several engine lathes from an undisclosed source was also a feature of the market.

Year-End Market Dip Not Too Drastic

CLEVELAND—The market here is dipping toward the usual year-end period of light sales, but the slump is not as drastic as expected. Buying activity of machine tool manufacturers themselves has been good in recent weeks, three companies having made purchases. A local producer of aircraft equipment has been in the market. The movement of small tools has contributed toward helping sustain sales volume, and a number of school jobs have been up for bids. Railroad purchases have been confined to only a few small tools.

Inquiries in Detroit Hinge on 1940 Designs

DETROIT — Among inquiries reported in the last week is one for $15,000 worth of welding equipment. This is said to be one of several active inquiries upon which decisions will be made shortly after the first of the year. Most of them are hinged very closely with 1940 automobile design programs. For the most part activity today is confined to replacement and repair business. The Masco Screw Products Co. in Detroit suffered a loss of $200,000 in buildings and equipment in a fire recently and is requiring replacements.

Sales Sluff Off at Year End in New York

NEW YORK—For most machine tool sellers in this area, December will be a low month as regards order volume, but one dealer reports sales for the first two weeks equal to the best of any month in 1938. Little is expected to materialize between now and the end of the year, what with the holidays and the general tendency to carry over machinery purchases to 1939 budgets. Aircraft companies have again been active in buying and the Navy is becoming more active at Brooklyn. General optimism is expressed as to a pickup in buying on the part of general industry in 1939.

November Machine Tool Index Shows Decline

CLEVELAND. — The November index of machine tools is 112.2, which shows a recession in total demand for machine tools of about 5 per cent less than October when the index was 118.1 and about 8 per cent less than August, when the figure was 120.9, the highest point of the year to date, according to the National Machine Tool Builders Association. Domestic business during November was slightly stronger, making that the best month of the year to date for domestic volume. Foreign orders are down proportionately. The three months' average, or trend, is slightly downward. It stands at 115.9, compared with 118.8 for the previous three-month period.

. GREAT BRITAIN .

. . . Business quiet as holiday period approaches.

LONDON, Dec. 20 (*By Cable*).—Business generally is quiet as the holiday period approaches. British foundry and forge pig iron prices for January to June are expected to be announced this week, but there is no hope of an export revival as Continental foundry iron is quoted at 67s., 6d., f.o.b., Antwerp, and if the British rebate scheme were not in force, foreign pig iron would compete here with British iron after paying freight and import duty.

The Continental steel market is very quiet. The Cartel may reduce British Empire prices and is almost certain to reduce prices for England to preserve the existing difference between English and Continental prices.

The tin plate price decision is expected in a few days. Tin plate business is quiet with unfilled orders below 2,250,000 base boxes.

The international black and galvanized sheet comptoirs have announced no intention of reducing the general export price of black and galvanized sheets.

Imports during November amounted to 66,000 tons, of which 4500 tons came from the United States.

Exports of pig iron amounted to 16,000 tons, of which none went to the United States. Tin plate exports amounted to 28,000 tons; black sheets to 6000 tons; galvanized sheets to 19,000 tons; total iron and steel to 181,000 tons.

Imports at Philadelphia

PHILADELPHIA.—The following imports were received in the Philadelphia market during the past week: 15 tons of flat wire, 40 tons of steel forgings, 16 tons of steel tubes and 2 tons of steel bars from Sweden; and 25 tons of structural shapes from Belgium.